SOLTEC®
CORPORATION

FILE 2093

OPERATOR/SERVICE MANUAL

for

SOLTEC 1241, 1242, 1243

250mm 1–3 PEN STRIP CHART RECORDERS

11684 PENDLETON STREET SUN VALLEY, CALIFORNIA 91352 (213) 767-0044

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SOLTEC CORPORATION

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FILE 2093

Return this page to SOLTEC CORPORATION

SOLTEC CORPORATION would like to keep all of its customers informed of any modifications that might improve the performance or reliability of SOLTEC recorders.

SOLTEC CORPORATION is always striving to improve its recorders to better meet the needs of users; therefore we believe you will benefit by completing the following blanks and returning it to:

Marketing Department
SOLTEC CORPORATION
11684 Pendleton Street
Sun Valley, California 91352

1. Date: _____

2. Model: _____ S/N: _____

3. Main Application:

   General Laboratory Use _____

   _____

   _____

   System _____

   _____

   _____

4. Features you would like to see in Strip Chart Recorders:

   _____

   _____

5. You first heard of SOLTEC through:

   Sales Rep. _____ Advertisement _____

   Trade Show _____ Associate _____

– Thank you very much for your assistance –

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WARRANTY

SOLTEC 1241 – 3 Strip Chart Recorders and Accessories shall have a one year warranty starting from the date of shipment to the original purchaser to be guaranteed for the defects on workmanship or materials under normal use.

All parts which become defective during the period of warranty shall be repaired and replaced without charge.

SOLTEC CORPORATION is not liable for consequential damages.

The specifications, etc. shall be subject to change without notice for the improvement of performance, reliability or service life.

SECTION 1

GENERAL INFORMATION

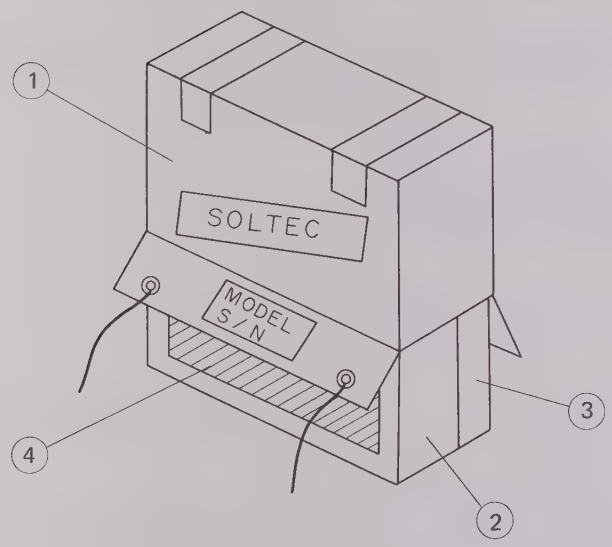
1.1 UNPACKING

1.1.1 General Description

The 1241—3 Flatbed Strip Chart Recorder that you have purchased is a precision instrument, therefore care is required for its handling.

1.1.2 Models 1241—2 Shipping Case

The shipping case of Models 1241 and 1242 consists of an external case made of corrugated cardboard and the inner case of styro-foam as shown in Fig. 1.1.
There is a compartment covered with the corrugated cardboard in the inner case cover section to house the accessories. The recorder is in a plastic bag and inserted in the lower part of the inner case attached with the shock absorber. Put your hands into the case holes provided on the both sides of the recorder and take the recorder out carefully.

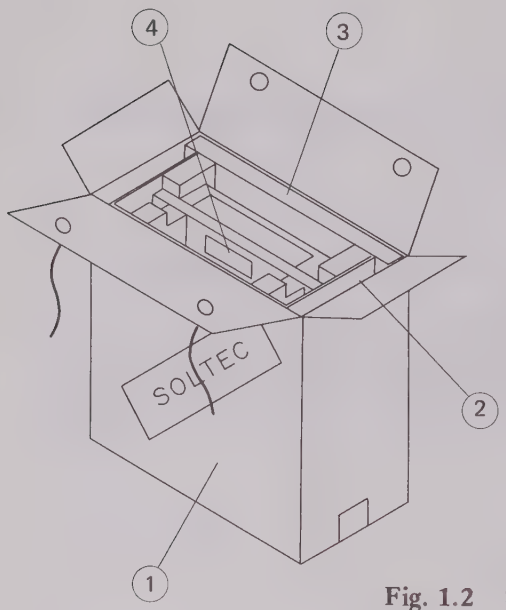


No.	Description	Material
1	Shipping case	Corrugated cardboard
2	Inner case cover	Styro-foam
3	Inner case lower part	Styro-foam
4	Cover for accessory compartment	Corrugated cardboard

Fig. 1.1 Shipping Case, 1241—2

1.1.3 Model 1243 Shipping Case

The shipping case for Model 1243 consists of the external case and inner housing in which the recorder and accessories are contained as shown in Fig. 1.2.
Place the external case vertically with the lid fastened by two strings at up position.
Unfasten the strings, open the lid and take out the box containing the accessories. Then using the handle provided at the bottom of the recorder and remove the recorder carefully.



No.	Description	Material
1	Shipping case	Corrugated cardboard
2	Inner housing	Corrugated cardboard with shock absorber
3	Accessory case	Corrugated cardboard
4	Handle of recorder	

Fig. 1.2 Shipping Case, 1243

1.1.4 Storage of Shipping Case

Keep all of the packing materials for use again in reshipment.

1.2 INSPECTION

1.2.1 Shipping Inspection

Before accepting the recorder from the shipping agent, inspect the shipping case in which the recorder is packed to see if it has any external damage.
The unpacked recorder should be inspected for damage during transportation.
Check for flaws such as scratchs, dents or damage to switches, connectors, etc.
Further, check whether screws, other parts loosened by vibration, or broken pieces of parts are left in the unpacked shipping case.
If any damage is observed, please notify your shipping agent.

1.3 DAMAGE DURING SHIPMENT

1.3.1 Damage found on arrival

If any defect is found on your recorder, the detailed information regarding the defect (in case the damage occurred during transportation, the document signed by the shipping agent) has to be given to SOLTEC CORPORATION or our agent in charge of your area, attaching with the proper model and serial numbers.
Upon receiving the information, SOLTEC CORPORATION will send you the service data or shipping instructions.
If you receive shipping instructions, return the recorder with freight prepaid to the destination specified.

In the above case, use the same packing materials with which your recorder was arrived and pack the recorder in the same manner. When the shipping case has been found considerably damaged, alternative and equivalent packing materials may be used.
Your recorder will be returned to you with freight prepaid after it is repaired at SOLTEC CORPORATION.

1.3.2 Accessories

When there is any error in types and numbers of the accessories, SOLTEC CORPORATION should be advised immediately. SOLTEC CORPORATION shall not bear any responsibility a claim that was not filed immediately after the receipt of the recorder.

1.4 REPAIR SERVICE

1.4.1 General Description

SOLTEC CORPORATION has a repair and calibration facility for these recorders.

1.4.2 Service

If you require service, contact the following:

Repair Department
SOLTEC CORPORATION
11684 Pendleton Street,
Sun Valley, California 91352

Phone: (213) 767-0044
Telex: 67-4188

SECTION 2

DESCRIPTION OF 1241 – 3 RECORDERS

2.1 OUTLINE

SOLTEC 1241−3 flatbed strip chart recorders are high performance recorders with 250mm chart width and 1 − 3 channel and overlapping pens which are the suitable for laboratory use and systems application. These recorders can be provided with a variety of options and input modules.

2.2 TYPES OF 1241−3 RECORDERS

2.2.1 Configurations Available

To assist you in deciding on the most suitable model for your application from this series, there are the following two methods:

2.2.2 Complete Type

This model of which specifications are fixed by SOLTEC CORPORATION is equipped with 23 chart speeds and 17 ranges input module for voltages from 1mV to 200V on each channel.

Model 1241	1-pen Recorder, Complete
Model 1242	2-pen Recorder, Complete
Model 1243	3-pen Recorder, Complete

Each of the input modules used in these models can be easily replaced with other modules and other optional features can be added with certain restrictions.

2.2.3 Mainframe Type

You can also choose the most desirable functions for your application from the options and input modules and configure them on the mainframe. However, this type requires selection of input modules for voltage, current or temperature for each channel.

Model 1241 MF	1-pen Mainframe
Model 1242 MF	2-pen Mainframe
Model 1243 MF	3-pen Mainframe

2.3 TYPES OF INPUT MODULES

2.3.1 Outline

Input modules developed for the 1241−3 recorders are available as follows:

DC voltage	:	18 kinds
DC current	:	21 kinds
Thermocouple/RTD temperature	:	15 kinds

2.3.2 Input Modules for DC Voltage

MODULE A (Single range):

Select from one of the following 17 ranges.

1 ..... 1mV,	2 ..... 2mV,	3 ..... 5mV,
4 ..... 10mV,	5 ..... 20mV,	6 ..... 50mV,
7 ..... 100mV,	8 ..... 200mV,	9 ..... 500mV,
10 ..... 1V,	11 ..... 2V,	12 ..... 5V,
13 ..... 10V,	14 ..... 20V,	15 ..... 50V,
16 ..... 100V,	17 ..... 200V	

MODULE B (17 ranges):

1, 2, 5, 10, 20, 50, 100, 200, 500mV,
1, 2, 5, 10, 20, 50, 100, 200V

2.3.3 Input Modules for DC Current

MODULE C (Single range):

Select from one of the following 18 ranges.

1 ..... 1μA,	2 ..... 2μA,	3 ..... 5μA,
4 ..... 10μA,	5 ..... 20μA,	6 ..... 50μA,
7 ..... 100μA,	8 ..... 200μA,	9 ..... 500μA,
10 ..... 1mA,	11 ..... 2mA,	12 ..... 5mA,
13 ..... 10mA,	14 ..... 20mA,	15 ..... 50mA,
16 ..... 100mA,	17 ..... 200mA,	18 ..... 500mA

MODULE D (6 ranges):

1, 2, 5, 10, 20, 50μA

MODULE E (6 ranges):

0.1, 0.2, 0.5, 1, 2, 5mA

MODULE F (6 ranges):

10, 20, 50, 100, 200, 500mA

2.3.4 Input Modules for Thermocouple/RTD Temperature

(NOTE: The input module does not include the thermal sensor.)

2.3.4.1 Non-linearized Type

MODULE 1 (3 ranges):
Type B (Pt 6% Rh/Pt 30% Rh) 100–500, 100–900, 100–1700°C

MODULE 2 (3 ranges):
Type E (Cr/Cu Ni) 0–200, 0–400, 0–800°C

MODULE 3 (3 ranges):
Type J (Fe/Cu Ni) 0–200, 0–400, 0–800°C

MODULE 4 (3 ranges):
Type K (Ni Cr/Ni Aℓ) 0–400, 0–800, 0–1200°C

MODULE 5 (3 ranges):
Type R (Pt/Pt 13% Rh) 0–400, 0–800, 0–1600°C

MODULE 6 (3 ranges):
Type S (Pt/Pt 10% Rh) 0–400, 0–800, 0–1600°C

MODULE 7 (3 ranges):
Type T (Cu/Cu Ni) -100–0, 0–200, 0–400°C

MODULE 8 (3 ranges):
Type RTD (Pt) -100–100, 0–200, 0–800°C

2.3.4.2 Linearized Type

MODULE 1 (3 ranges):
Type B (Pt 6% Rh/Pt 30% Rh) 100–500, 100–900, 100–1700°C

MODULE 2 (3 ranges):
Type E (Cr/Cu Ni) 0–200, 0–400, 0–800°C

MODULE 3 (3 ranges):
Type J (Fe/Cu Ni) 0–200, 0–400, 0–800°C

MODULE 4 (3 ranges):
Type K (Ni Cr/Ni Aℓ) 0–400, 0–800, 0–1200°C

MODULE 5 (3 ranges):
Type R (Pt/Pt 13% Rh) 0–400, 0–800, 0–1600°C

MODULE 6 (3 ranges):
Type S (Pt/Pt 10% Rh) 0–400, 0–800, 0–1600°C

MODULE 7 (3 ranges):
Type T (Cu/Cu Ni) -100–0, 0–200, 0–400°C

2.4 OPTIONS

2.4.1 Outline

The options for 1241–3 recorders are as follows:

2.4.2 Options for Model 1241

OPTION 1	Chart Take-up (built-in type)
OPTION 2	Event Marker (right side)
OPTION 3	Electric Pen Lift
OPTION 5	Electronic Limit Switch (1-channel, module case)
OPTION 8	Carrying/Shipping Case
OPTION 12	Retransmitting Potentiometer Output (1-channel)

2.4.3 Options for Model 1242

OPTION 1	Chart Take-up (built-in type)
OPTION 2	Event Marker (right side)
OPTION 3	Electric Pen Lift (separate or simultaneous pen lift)
OPTION 6	Electronic Limit Switch (2-channel, module case)
OPTION 8	Carrying/Shipping Case
OPTION 10	Synchronizer (module case)
OPTION 12	Retransmitting Potentiometer Output (2-channel)

2.4.4 Options for Model 1243

OPTION 1	Chart Take-up (built-in type)
OPTION 2	Event Marker (right side)
OPTION 4	Electric Pen Lift (simultaneous pen lift)
OPTION 7	Electronic Limit Switch (3-channel, special type installed into input module)
OPTION 9	Carrying/Shipping Case
OPTION 11	Synchronizer (installed on the bottom part of the recorder)
OPTION 12	Retransmitting Potentiometer Output (3-channel)

2.5 MAJOR OPTIONS

2.5.1 Electric Pen Lift

If the electric pen lift function is installed, the recording pen(s) of the recorder can be controlled externally by the remote signal, for PEN LIFT as well as the Pen Lift Switch on the recorder. This function eliminates the waste of chart paper by lifting the pen to the UP position and switching the chart drive remote control provided on the recorder to the OFF when the signal is not being recorded.

With Model 1242, each pen can be remotely controlled for each channel independently or both pens simultaneously.

With Model 1243, the pens for all channels are lifted simultaneously.

2.5.2 Electronic Limit Switch

The electronic limit switch is capable of setting upper/lower limit points accurately and individually by means of a potentiometer dial which corresponds to 0 — 100% of the chart paper. When the input signal crosses the upper/lower limit points which were set, a signal is output on the appropriate pin of the connector mounted on the rear panel through an open collector transistor.
This signal can be utilized for temperature inputs as well as voltage.

2.5.3 Retransmitting Potentiometer Output

The precision retransmitting potentiometer is connected to the servo-mechanism of the recorder and the variation of the resistance value is output for each channel on the appropriate pin of the connector on the rear panel.
The output optimum level to the system is proportional to the change of the input signal even if the input signal of the recorder is very low or very high. By using this option, it is unnecessary to use an expensive amplifier or attenuator. This option is available on all models of this recorder. However, this option is available on all channels or on only selected channel(s) with Models 1242 and 1243.

2.5.4 Synchronizer

The digital technique and circuitry which is used to electronically correct for the mechanical pen spacing offset is a synchronizer. In other words, the signal connected to the 1st channel is delayed to the starting point of the 3rd channel (8mm on the time axis) and the signal connected to the 2nd channel is similarly delayed to the starting point of the 3rd channel (4mm on the time axis), corresponding to the chart paper driving speed, and the signals for 3 (or 2) channels are recorded, matching the starting points on a common time axis.

2.5.5 Event Marker (Separate Pen)

The event marker pen is mounted on the right side of the recorder, separate from the recording pen.
This pen operates with the signal supplied externally, marking within the marking space (8mm wide) provided at the right end of the chart paper.
There are many applications for this marker depending on the modes of the signals, for example, if the signal is supplied at a certain time interval, accurate elapsed time can be known for the purpose of analyzing data. In addition, if the marking is being made an event, it is convenient for correlating the data with events.

2.5.6 Chart Take-up

With the use of this option, the recorded chart paper can be rolled neatly without occupying much space.
This option also makes long term operation of the recorder convenient.

2.6 ORDERING OPTIONS

2.6.1 Model 1241

All of the options may be ordered with 1241 except the synchronizer.
However, all of the options must be installed at the SOLTEC CORPORATION factory.

2.6.2 Model 1242

The electric pen lift and event marker can not be installed together.
The electronic limit switch and synchronizer can not be installed at the same time.
Except for the above two conditions, any possible combination of options is possible.
However, all of the options must be installed at the SOLTEC factory.

2.6.3 Model 1243

When electric pen lift and event marker are mounted together, UP/DOWN movement of the event marker pen is manually operated.
Options must be installed at the SOLTEC CORPORATION factory.

2.7 MAIN FEATURES

2.7.1 All Solid State Electronic Circuit

The all solid state electronic circuits are used for the 1241–3 recorders in order to ensure minimum dead band, excellent pen response, high noise rejection and stable temperature characteristics. The chopper circuit is a 1kHz modulation which is not effected by the power frequency, and a special FET is selected for the stability requirements of the recorder.

2.7.2 Self-contained Precision Calibration Source, (1mV Range)

By setting the switch at the "CAL." position on the input module panel, correction for the minor changes in chart paper width due to changes in temperature and humidity or verification of CALIBRATION can be easily performed without using a precision external voltage source.

2.7.3 Event Marker (Superimposed)

In order to identify the TIME-OF-EVENT and a time difference between channels, the pulse signal equivalent to approx. 3.5 chart graduations is superimposed on each recorded trace during recording each time the "MARKER" switch on the control panel of CHART UNIT is pushed. This signal may also be activated by the external input on the rear panel.

2.7.4 Servomotor Protection

An automatic torque reduction circuit is provided to prevent the pen servomotor from damage from a continuous overrange input.

2.7.5 Platen

The platen section is very wide to facilitate writing on the chart paper during recording.
The large platen also makes observation of the recorded data easier.

2.7.6 Chart Speeds

A pulse motor (stepping motor) is used for driving the chart paper of the Series 1240 recorders. A tuning fork oscillator is employed for the motor drive signal to insure stable and accurate paper drive speed, 24-step/23-speed chart speed selections can be used over a long periods of time, irrespective of power frequency fluctuation.
A "REMOTE CONTROL CHART DRIVE" function which is capable of synchronizing the chart paper speed with manufacturing process, velocity, displacement or other signals is supplied as standard.

2.7.7 Fast Forward Switch

While pushing the "FAST" switch, the chart paper advances at the rate of 60cm/min regardless of where the "SPEED" switch on the control panel of Chart Unit is set.
This makes spacing between data, spacing before starting new data or providing a margin easy.

2.7.8 "END OF CHART" Indicator

When the chart paper in the recorder runs out, the operator of the recorder is signaled with a blinking pilot lamp "DRIVE" on the control panel of the CHART unit and an audible alarm signal. Also, the chart paper drive and pen servo electronics are automatically disabled to prevent fouling of the chart roller and unnecessary wear of the pen.

2.7.9 Pen

The fiber tip pen eliminates all the classical problems of chart recording such as hazy line or dripping of ink due to change of ambient temperature, etc., so that there will be no lost of important data.

2.7.10 Horizontal, Inclined or Vertical Installation

Models 1241 and 1242 can be installed at any angle ranging from a horizontal position to a vertical position.
The installation angle is limited with Model 1243, because of its construction, from a horizontal position to 12° as determined by a stand provided at the rear side of the recorder.
When any of the model is used in an angle greater than 12°, Z-fold chart paper cannot be used.
When operating the recorder at a steep angle or a vertical position, be sure to use roll chart paper along with an auto chart take-up device.

SECTION 3

SPECIFICATIONS

3.1 SPECIFICATIONS OF MODELS 1241–3 RECORDERS

Model Number		1241	1242	1243
Number of Channels *1		1	2	3
Recording System		Automatic zero-balancing, continuous-line recording		
Writing Width		250mm		
Pen Speed *2		Better than 750mm/sec. (1/3 sec. F.S.)		
Zero Reference Point		Right hand of the chart paper		
Zero Set Range		−100% — 0 — +100%		
MEASURE/CHECK/CALIBRATE Switch		Standard		
Measuring Ranges		Standard 17-ranges, 1, 2, 5, 10, 20, 50, 100, 200 and 500mV, 1, 2, 5, 10, 20, 50, 100 and 200V See optional input module sections for specifications on temperature & current modules.		
Range Vernier *3		Standard		
Polarity Switch		Standard		
Input System		Floating		
Input Impedance		1MΩ constant		
Permissible Signal Source Resistance		Up to 10kΩ		
Accuracy *4		±0.3% (23°C), Temperature coefficient; ±0.025%/°C max.		
Errors between Ranges		2mV to 50mV ranges: Error; ±0.15% (23°C) Temperature coefficient; ±0.005%/°C max. 100mV to 200V ranges: Error; ±0.2% (23°C) Temperature coefficient; ±0.0075%/°C max.		
Dead Band		±0.1%		
Linearity		±0.25%		
Noise Rejection *5	CMRR	DC Above 160dB AC (50/60Hz) Above 160dB		
	NMRR	AC (50/60Hz) Above 160dB		
Temperature Characteristics		(Max. Sensitivity Range. 30min. Warm-up) 1) Warm-up: Less than ±0.5% (at constant room temperature) 2) After warm-up: Less than ±0.15%/10°C		
Chart Speeds *6		(1) 24 steps/23 speed of 10, 15, 20, 30, 40, 60mm/h, cm/h, mm/min, cm/min (10mm/min and 60cm/h are overlapping) (2) Remote chart drive control External signal applied to remote control connector "CHART OSC" upon setting chart speed unit selection switch on the panel to "EXT." position. ● Chart speed: 1mm/min at 1Hz, 600Hz max. ● Input impedance: Over 4.7kΩ ● External signal source: Voltage; High level +2V ~ +20V Low level +0.8V ~ −20V (Operable at TTL level) Waveform; Pulse, Sine wave, Square wave, Triangular wave, etc. with pulse width of 50μ sec. or more		
Chart Drive		Sprocket		
Manual Chart Rewind		Standard		

Model Number		1241	1242	1243
Chart Paper		Grid: 250mm, right zero. 20m long P/N: RN2-01-25-20M (Roll) ZN2-01-25-20M (Z-fold)		
Recording Pens		Cartridge type fiber tip pen		
Ink Color		Red	Channel 1: Red Channel 2: Green	Channel 1: Red Channel 2: Green Channel 3: Blue
Pen Lift		Manual	Individually and manually operated (Distance between pens: 4mm)	
Calibration Voltage		Voltage; +1mV Accuracy; ±0.2% (23°C) Temperature coefficient; ±0.007%/°C		
Torque Reduction Circuit	*7	Standard		
Chart Fast Switch		Standard		
End of Chart Alarm		Standard		
Superimposing Event Marker	*8	Superimposed event mark on trace: Amplitude; +3.5 ±1 graduation, Time; 0.2~0.4 sec.		
Environment	*9	Temperature: 0 to 45°C Humidity: 45 to 85%		
Power Source		115VAC ±10%, 50/60Hz		
Power Consumption (Typical)	Balanced	19VA	21VA	23VA
	Maximum	32VA	47VA	62VA
Insulation Resistance		Power-chassis (GND); Over 50MΩ (500V DC megger) Input terminal-chassis (GND); Over 100MΩ (500V DC megger)		
Dielectric Strength		Power-chassis (GND); 1000V AC for 1 minute Input terminal-chassis (GND); 1000V AC for 1 minute		
External Dimensions		430(W) X 123(H) X 354(D)mm		430(W) X 170(H) X 410(D)mm
Weight		7kg	8kg	11kg

NOTES:

*1 For models 1241 and 1242, the short recording pen is for channel 1 and the longer one is for channel 2. For 1243, the recording pens are, channel 3, channel 2 and channel 1 from front to rear.

*2 Time required for travelling 99% of the chart width.

*3 Each of the measuring ranges can be expanded up to 2.5 times.

*4 Accuracy including linearity when measured at the maximum sensitivity by setting the polarity switch at "+".

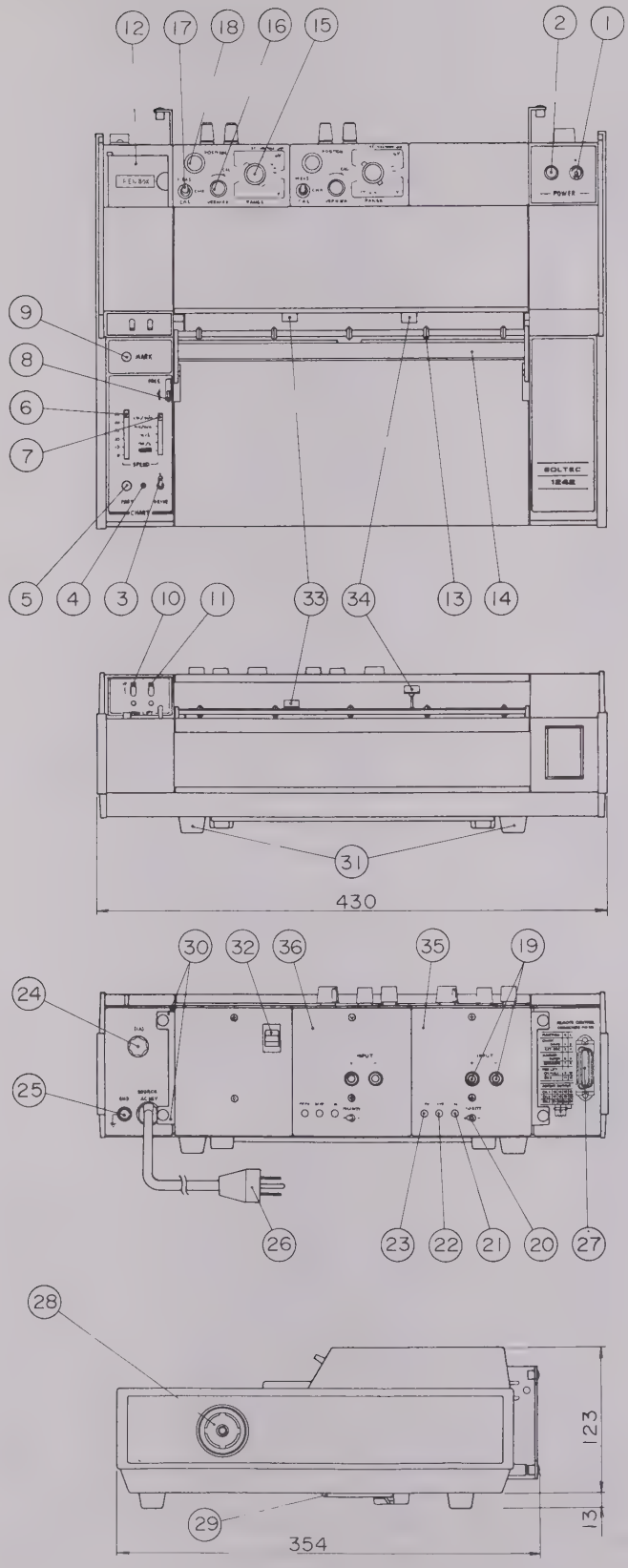
*5 The values for measurement at maximum sensitivity range are shown.

*6 The chart drive may be remotely operated. In this case, remote control connector "CHART DRIVE" is used. (TTL level.)

*7 This is a circuit to protect the DC servomotor when a voltage exceeding the measuring range is applied.

*8 External control by TTL or contact closure input is also possible. A remote control connector "MARK SUPER" (Pin Nos. 5 and 6) is used.

*9 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.

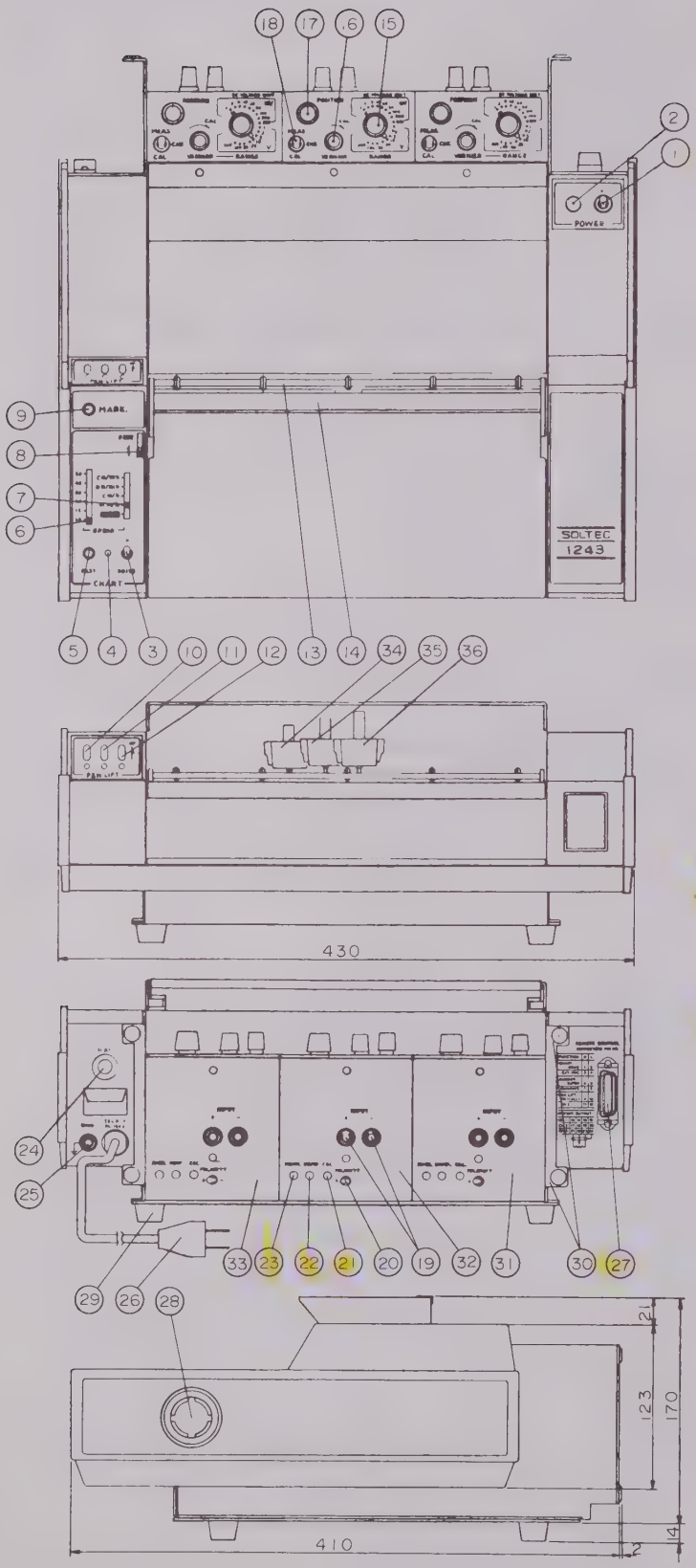


No.	Descriptions
1	Power switch
2	Power indicator lamp
3	Chart drive switch
4	Chart drive indicator lamp
5	Chart fast switch
6	Chart speed selection switch
7	Chart speed unit selection switch
8	Chart free lever
9	Event marker switch
10	Channel 1 pen lift lever
11	Channel 2 pen lift lever
12	Pen cap box
13	Chart roller
14	Chart cutter
15	Measuring range selection switch
16	Range vernier
17	MEASURE/CHECK/CALIBRATE switch
18	Position control
19	Input terminals
20	Polarity switch
21	Full span voltage calibrator
22	Damping control
23	Marker amplitude adjuster
24	Fuse holder
25	Ground terminal
26	Power plug
27	Remote control connector
28	Chart rewind wheel
29	Tilt stand
30	Power cord holder
31	Rubber foot
32	Power cord clamp
33	Channel 1 recording pen
34	Channel 2 recording pen
35	Channel 1 input module
36	Channel 2 input module

NOTE:

With Model 1241, the input module for channel 2, pen lift lever and the recording pen for channel 2 side are not mounted.

Fig. 3.1 External View, 1241–2



No.	Descriptions
1	Power switch
2	Power indicator lamp
3	Chart drive switch
4	Chart drive indicator lamp
5	Chart fast switch
6	Chart speed selection switch
7	Chart speed unit selection switch
8	Chart free lever
9	Event marker switch
10	Channel 1 pen lift lever
11	Channel 2 pen lift lever
12	Channel 3 pen lift lever
13	Chart roller
14	Chart cutter
15	Measuring range selection switch
16	Range vernier
17	Position control
18	MEASURE/CHECK/CALIBRATE switch
19	Input terminals
20	Polarity switch
21	Full span voltage calibrator
22	Damping control
23	Marker amplitude adjuster
24	Fuse holder
25	Ground terminal
26	Power plug
27	Remote control connector
28	Chart rewind wheel
29	Rubber foot
30	Power cord holder
31	Channel 1 input module
32	Channel 2 input module
33	Channel 3 input module
34	Channel 1 recording pen
35	Channel 2 recording pen
36	Channel 3 recording pen

Fig. 3.2 External View, 1243

3.2 SPECIFICATIONS OF INPUT MODULES

3.2.1 DC Voltage Input Modules

Model Number	MODULE A	MODULE B
Number of Ranges	Single-range, one range from 18 ranges	Multi-range, 17-step selection
Applied Models	1241-MF, 1242-MF, 1243-MF and 1241, 1242, 1243	
Zero Reference Point	Right end of chart paper	
Zero Set Range	±100% having the reference point at the center (5-turn potentiometer)	
MEASURE/CHECK/CALIBRATE Switch	Standard	
Measuring Ranges	One range from 1, 2, 5, 10, 20, 50, 100, 200, 500mV and 1, 2, 5, 10, 20, 50, 100, 200V	17-ranges; 1, 2, 5, 10, 20, 50, 100, 200 and 500mV, 1, 2, 5, 10, 20, 50, 100 and 200V
Range Vernier *1	Standard	
Polarity Switch	Standard	
Input System	Floating	
Input Impedance	1~50mV range; Almost infinitive 100mV~200V range; 1MΩ	1MΩ constant
Permissible Signal Source Resistance	Less than 10kΩ	
Accuracy *2	±0.2% (23°C), Temperature coefficient; ±0.025%/°C max.	
Errors between Ranges	———	2mV~50mV range; ±0.15% (23°C), Temperature coefficient; ±0.005%/°C max. 0.1V~200V range; ±0.2% (23°C), Temperature coefficient; ±0.0075%/°C max.
Dead Band	±0.1%	
Superimposing Event Marker	Amplitude; 3.5 ± 1 graduation, Time; 0.2~0.4 sec. (set at frame side)	
Calibration Voltage	Voltage; Value in measuring ranges (Calibration voltage which measuring range is more than 1V is to be 1V.) Accuracy; ±0.2% (23°C) Temperature coefficient; ±0.007%/°C	Voltage; +1mV Accuracy; ±0.2% (23°C) Temperature coefficient; ±0.007%/°C

Model Number		MODULE A	MODULE B
Noise Rejection	CMRR	DC Above 160dB AC (50/60Hz) Above 160dB	
	NMRR	AC (50/60Hz) Above 64dB	
Temperature Characteristics		(Max. sensitivity range. 30 min. warm-up) 1) Warm-up; Less than ±0.5% (at constant room temperature) 2) After warm-up; Less than ±0.15%/10°C	
Environment *3		Temperature; 0 to 45°C, Humidity; 45 to 85%	
Weight		600g	650g
Accessories		Switch cap; (Red, green, white) 1 each Color sheet; (Red, green, white) 1 each	

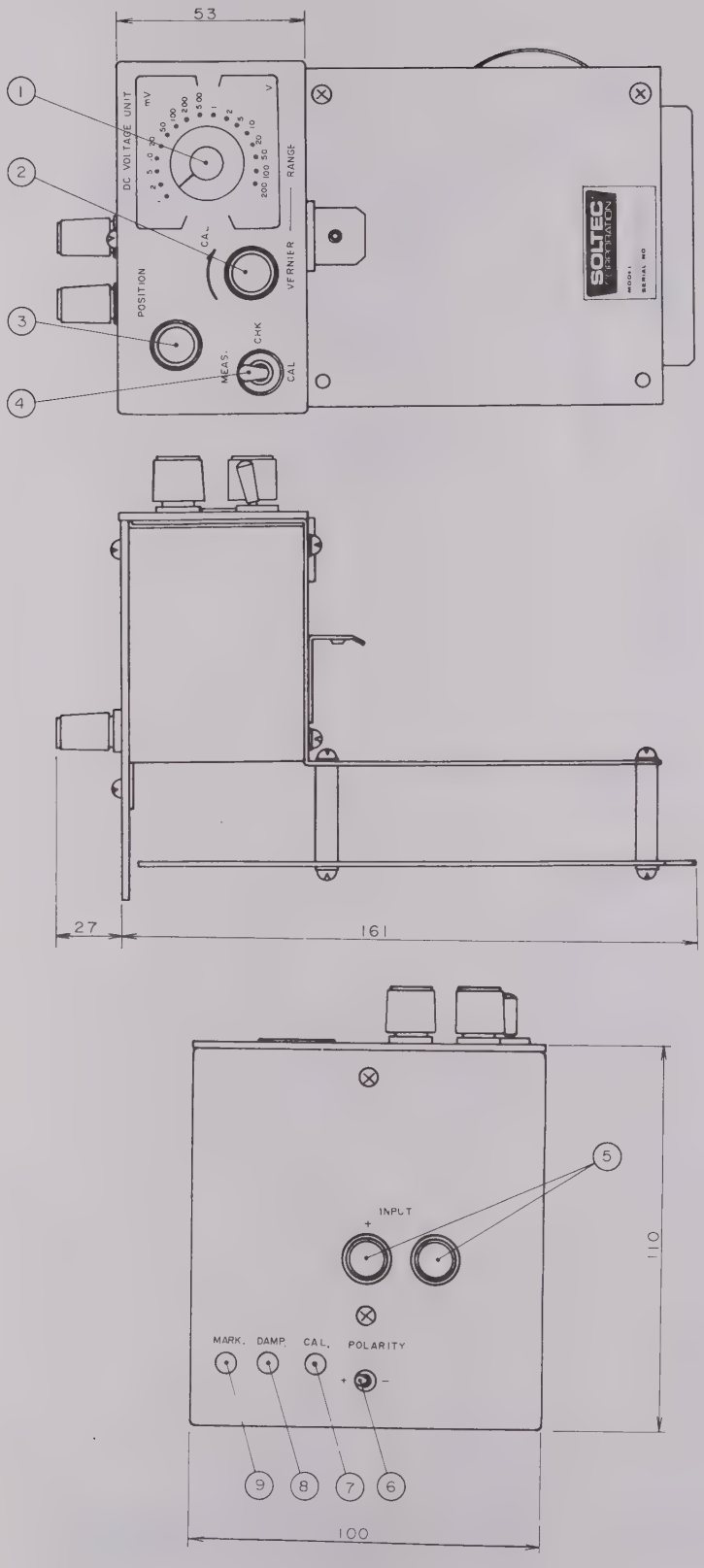
NOTES:

The specified value for each item shows the value assembled with the applicable mainframe.

*1 Measuring range can be expanded up to 2.5 times.

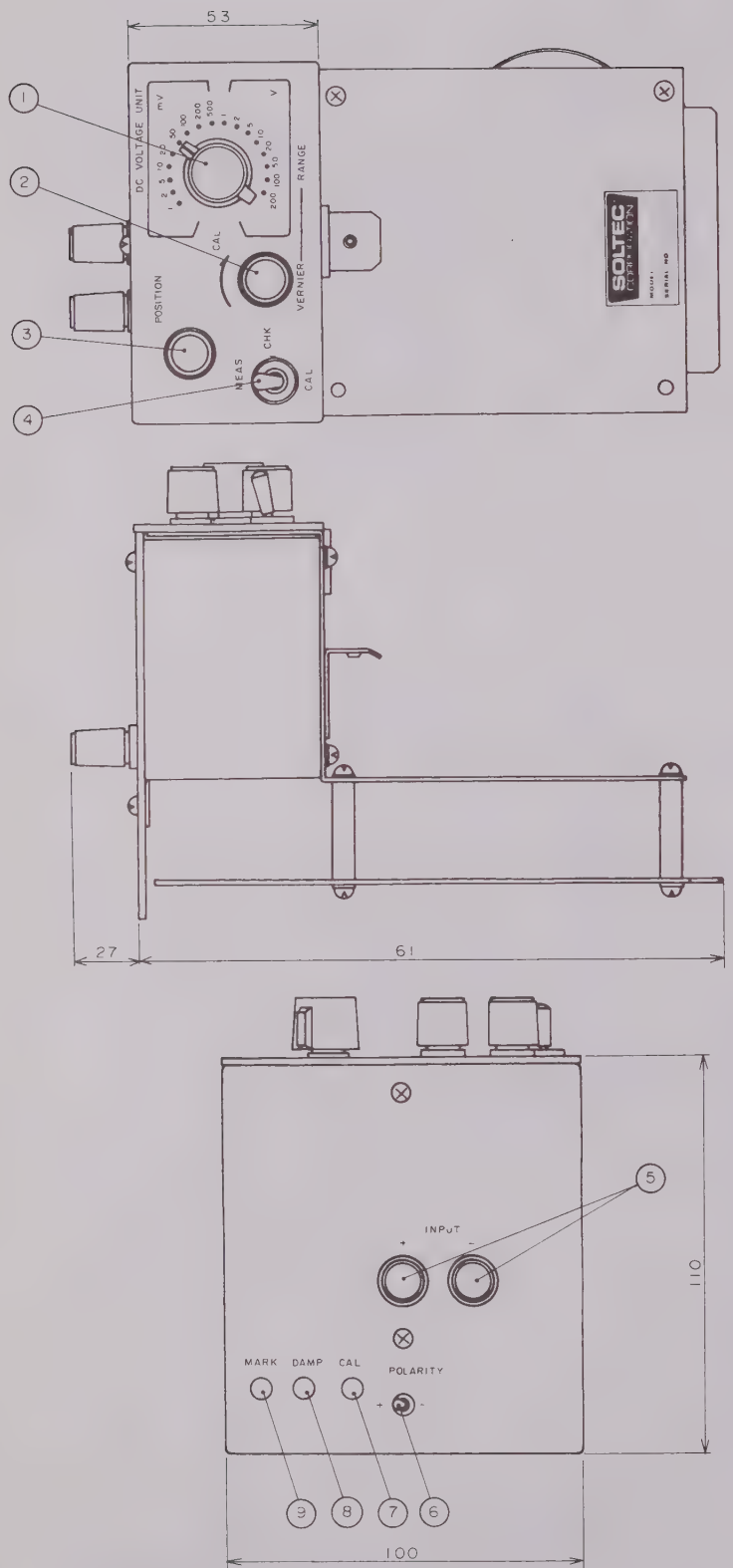
*2 ● Accuracy for full span voltage calibration using the built-in calibration voltage (linearity is excluded).
● Accuracy of inverse polarity selection is within ±0.2% (23°C).

*3 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.



No.	Descriptions
1	Measuring range
2	Range vernier control
3	Position control
4	MEASURE/CHECK/CALIBRATE switch
5	Input terminals
6	Polarity switch
7	Full span voltage calibrator
8	Damping control
9	Marker amplitude adjuster

Fig. 3.3 External View of MODULE A Single Range DC Voltage Input Module (Example of 1mV F.S.)



No.	Descriptions
1	Measuring range selection switch
2	Range vernier control
3	Position control
4	MEASURE/CHECK/CALIBRATE switch
5	Input terminals
6	Polarity switch
7	Full span voltage calibrator
8	Damping control
9	Marker amplitude adjuster

Fig. 3.4 External View of MODULE B Multi Range DC Voltage Input Module

3.2.2 DC Current Input Modules

Model Number		MODULE C	MODULE D	MODULE E	MODULE F
Number of Ranges		Single-range, one range from 18 ranges	Multi-range, 6-step selection		
Applied Models		1241-MF, 1242-MF, 1243-MF and 1241, 1242, 1243			
Zero Reference Point		Right end of chart paper			
Zero Set Range		±100% having the reference point at the center (5-turn potentiometer is used.)			
MEASURE/CHECK/CALIBRATE Switch		Standard			
Measuring Range		One range from 1, 2, 5, 10, 20, 50μA or 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500mA	1, 2, 5, 10, 20, 50μA (6 ranges)	0.1, 0.2, 0.5, 1, 2, 5mA (6 ranges)	10, 20, 50, 100, 200, 500mA (6 ranges)
Range Vernier	*1	Standard			
Polarity Switch		Standard			
Input System		Floating			
Input Resistance		1~50μA; Approx. 1kΩ, 0.1~5mA; Approx. 10Ω 10~500mA; Approx. 0.1Ω	Approx. 1kΩ	Approx. 10Ω	Approx. 0.1Ω
Accuracy	*2	±0.3% (23°C), Temperature coefficient; ±0.025%/°C max.			
Errors between Ranges		———	±0.15% (23°C), Temperature coefficient; ±0.005%/°C max.		
Dead Band		±0.1%			
Superimposing Event Marker		Amplitude; 3.5 ± 1 graduation, Time; 0.2~0.4 sec. (set at frame side)			
Calibration Voltage		Signal equivalent to full span	Signal equivalent to 1μA (Approx. 1mV)	Signal equivalent to 0.1mA (Approx. 1mV)	Signal equivalent to 10mA (Approx. 1mV)
		Accuracy; ±0.3% (23°C), Temperature coefficient; ±0.007%/°C max.			
Noise Rejection	*3 CMRR	DC Above 160dB AC (50/60Hz) Above 160dB			
	NMRR	AC (50/60Hz) Above 64dB			
Temperature Characteristics		(Max. sensitivity range. 30min. Warm-up) 1) Warm-up; Less than ±0.5% (at constant room temperature) 2) After warm-up; Less than ±0.15%/10°C			

Model Number	MODULE C	MODULE D	MODULE E	MODULE F
Environment *4	Temperature; 0 to 45°C, Humidity; 45 to 85%			
Weight	600g			
Accessories	Switch cap; (Red, green, white) 1 each Color sheet; (Red, green, white) 1 each			

NOTES:

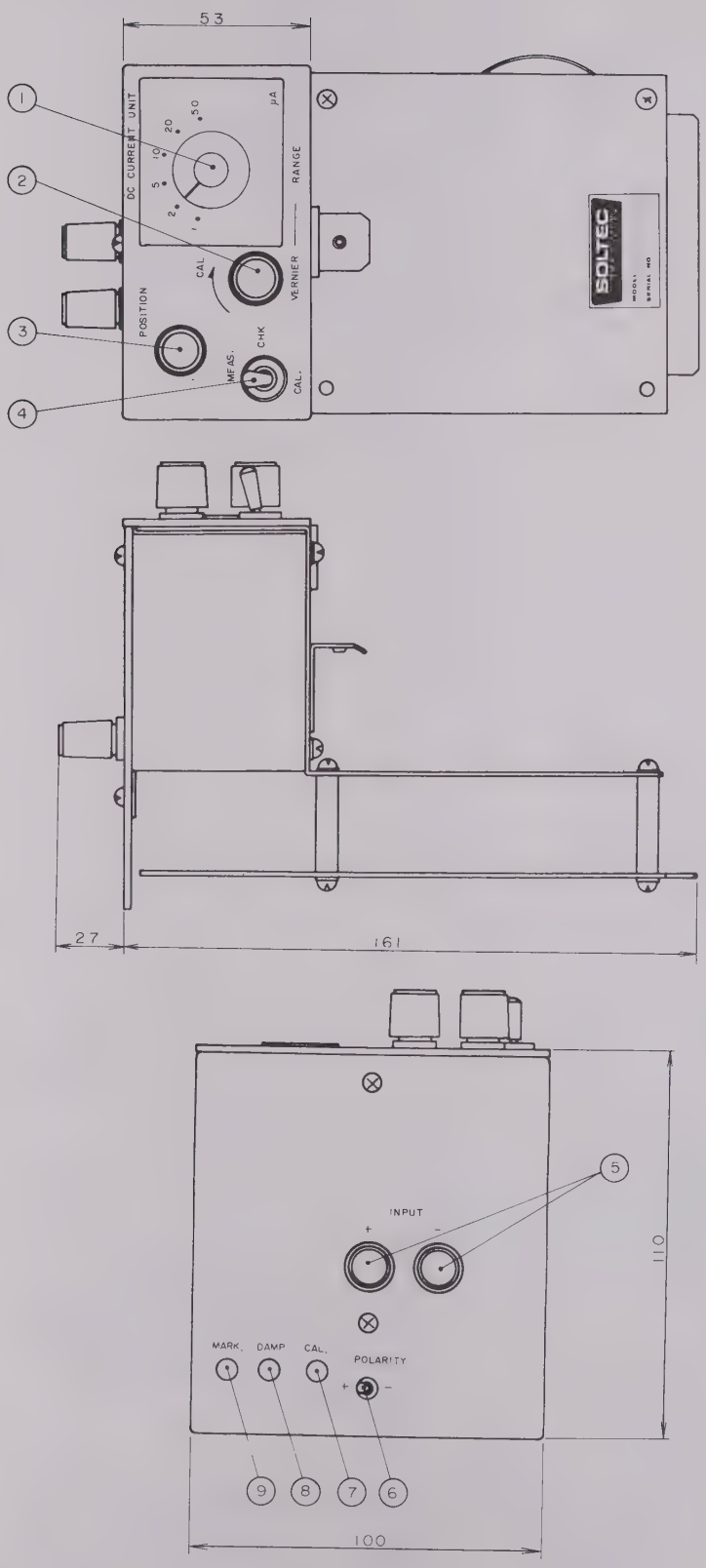
The specified value for each item shows the specification for the unit assembled with the applicable mainframe.

*1 Each measuring range can be expanded up to 2.5 times.

*2 ● Accuracy of full span calibration is specified at the maximum sensitivity range by using the built-in calibration signal (linearity is excluded).
● Accuracy of inverse polarity selection is within ±0.2% (23°C).

*3 The value at maximum sensitivity range is shown.

*4 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.

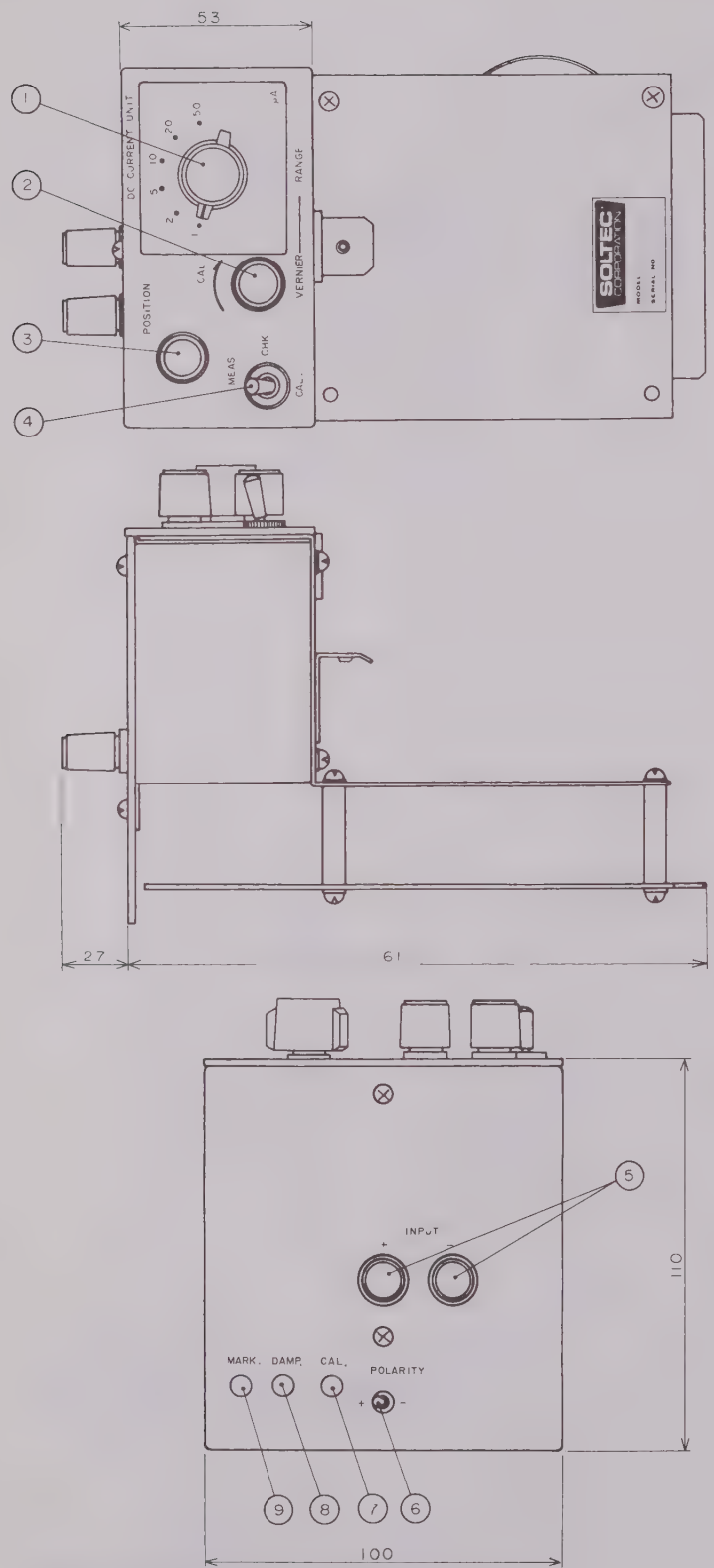


No.	Descriptions
1	Measuring range
2	Range vernier control
3	Position control
4	MEASURE/CHECK/CALIBRATE switch
5	Input terminals
6	Polarity switch
7	Full span voltage calibrator
8	Damping control
9	Marker amplitude adjuster

Fig. 3.5 External View of MODULE C Single Range DC Current Input Module (Example of 2μA F.S.)

NOTE:

The measuring range differs from model to model.



No.	Descriptions
1	Measuring range selection switch
2	Range vernier control
3	Position control
4	MEASURE/CHECK/CALIBRATE switch
5	Input terminals
6	Polarity switch
7	Full span voltage calibrator
8	Damping control
9	Marker amplitude adjuster

Fig. 3.6 External View of MODULE D, E and F Multi Range DC Current Input Module (Example of MODULE D)

NOTE:

The measuring range differs from model to model.

3.2.3 Thermocouple/Temperature Input Modules (none-linearized)

Model Number		MODULE 1	MODULE 2	MODULE 3	MODULE 4	MODULE 5	MODULE 6	MODULE 7
Number of Ranges		Multi-range, 3-step selection						
Applied Models		1241-MF, 1242-MF, 1243-MF and 1241, 1242, 1243						
Applied Thermocouples		B (PT 6% Rh/Pt 30% Rh)	E (Cr/Cu Ni)	J (Fe/Cu Ni)	K (Ni Cr/Ni Al)	R (Pt/Pt 13% Rh)	S (Pt/Pt 10% Rh)	T (Cu/Cu Ni)
Reference Point		Right end of chart paper						
Zero Set Range		±2% having the reference point at the center						−100~0°C range; A position of 100% (0°C) to left from the reference point. ±2% having at the center 0~200°C/400°C ranges; ±2% having the reference point at the center
MEASURE/CHECK/CALIBRATE Switch		Standard						
Measuring Ranges		100~500°C (0.033~1.241mV) 100~900°C (0.033~3.957mV) 100~1700°C (0.033~12.426mV)	0~200°C (0~13.419mV) 0~400°C (0~28.943mV) 0~800°C (0~61.022mV)	0~200°C (0~10.777mV) 0~400°C (0~21.846mV) 0~800°C (0~45.498mV)	0~400°C (0~16.395mV) 0~800°C (0~33.277mV) 0~1200°C(0~48.828mV)	0~400°C (0~3.407mV) 0~800°C (0~7.949mV) 0~1600°C(0~18.842mV)	0~400°C (0~3.260mV) 0~800°C (0~7.345mV) 0~1600°C(0~16.771mV)	−100~0°C(−3.378~0mV) 0~200°C (0~9.286mV) 0~400°C (0~20.869mV)
Input System		Floating						
Input Impedance		Almost infinite						
Accuracy	*1	±0.45% (23°C)	±0.2% (23°C), Temperature coefficient; ±0.025%/°C max.					
Dead Band		±0.1%						
Cold Junction Compensator	*2	Not available	Accuracy; ±1.2°C (5°C ~ 40°C)					
Superimposing Event Marker		Amplitude, 3.5 ± 1 graduation, Time; 0.2 ~ 0.4 sec. (set at the frame side)						
Calibration Voltage	*3	Voltage; +1.208mV (1.241mV − 0.033mV)	Voltage; +13.419mV	Voltage; +10.777mV	Voltage; +16.395mV	Voltage; +3.407mV	Voltage; +3.260mV	Voltage; −3.378mV
		Accuracy; ±0.2% (23°C), Temperature coefficient; ±0.007%/°C						
Noise Rejection	CMRR	DC Above 160dB AC (50/60Hz) Above 160dB						
	NMRR	AC (50/60Hz) Above 64dB						
Temperature Characteristics		(Max. sensitivity range. 30 min. Warm-up) 1) Warm-up; Less than ±0.5% (at constant room temperature) 2) After warm-up; Less than ±0.15%/10°C						
Environment	*4	Temperature; 0~45°C, Humidity; 45~85%						
Weight		600g						
Accessories		Switch cap; (Red, green, white) 1 each Color sheet; (Red, green, white) 1 each						

NOTES:

The specification for each item shows the value assembled with the applicable mainframe.

*1 Accuracy of full span voltage calibration by using the built-in calibration voltage when assembled with the applicable mainframe (linearity is excluded).

*2 With INT./EXT. selection switch.

*3 Equivalent to F.S. voltage at the maximum sensitivity range.

*4 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.

3.2.4 RTD/Temperature Input Module (non-linearized)

Model Number	MODULE 8
Number of Ranges	Multi-range, 3-step selection
Applied Models	1241-MF, 1242-MF, 1243-MF and 1241, 1242, 1243
Applied RTD	Platinum 100Ω PT-100 Resistance Bulb
Reference Point	Right end of chart paper
Zero Set Range	±2% having the reference point at the center
MEASURE/CHECK/CALIBRATE Switch	Standard
Measuring Ranges	-100 ~ 100°C 0 ~ 200°C 0 ~ 800°C
Input System	Floating
Accuracy *1	±0.5%
Dead Band	±0.1%
Superimposing Event Marker	Amplitude; 3.5 ± 1 graduation, Time; 0.2 ~ 0.4 sec. (set at frame side)
Calibration Voltage	Voltage equivalent to full span temperature of maximum sensitivity range (approx. 10mV)
	Accuracy; ±0.2% (23°C) Temperature coefficient; ±0.007%/°C max.
Temperature Characteristics	(Max. sensitivity range. 30 min. Warm-up) 1) Warm-up; Less than ±0.5% (at constant room temperature) 2) After warm-up; Less than ±0.15%/10°C
Environment *2	Temperature; 0 to 45°C, Humidity; 45 to 85%
Weight	600g
Accessories	Switch cap (red, green, white) 1 each Color sheet (red, green, white) 1 each

NOTES:

The specified value for each item shows the value of the unit assembled with the applicable mainframe.

*1 Accuracy of full span voltage calibration by using the built-in calibration signal (linearity and RTD tolerance are not included).

*2 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.

3.2.5 Thermocouple/Temperature Input Modules (linearized)

Model Number		MODULE 1	MODULE 2	MODULE 3	MODULE 4	MODULE 5	MODULE 6	MODULE 7
Number of Ranges		Multi-range, 3-step selection						
Applied Models		1241-MF, 1242-MF, 1243-MF and 1241, 1242, 1243						
Applied Thermocouples		B (Pt 6% Rh/Pt 30% Rh)	E (Cr/Cu Ni)	J (Fe/Cu Ni)	K (Ni Cr/Ni Al)	R (Pt/Pt 13% Rh)	S (Pt/Pt 10% Rh)	T (Cu/Cu Ni)
Reference Point		Right end of chart paper						
Zero Set Range		±2% having the reference point at the center						−100°C~0°C; A position of 100% (0°C) to left from the reference point. ±2% having at the center 0~200°C/400°C ranges; ±2% having the reference point at the center
MEASURE/CHECK/CALIBRATE Switch		Standard						
Measuring Ranges		100~500°C (0.033~1.241mV) 100~900°C (0.033~3.957mV) 100~1700°C (0.033~12.426mV)	0~200°C (0~13.419mV) 0~400°C (0~28.943mV) 0~800°C (0~61.022mV)	0~200°C (0~10.777mV) 0~400°C (0~21.846mV) 0~800°C (0~45.498mV)	0~400°C (0~16.395mV) 0~800°C (0~33.277mV) 0~1200°C(0~48.828mV)	0~400°C (0~3.407mV) 0~800°C (0~7.949mV) 0~1600°C(0~18.842mV)	0~400°C (0~3.260mV) 0~800°C (0~7.345mV) 0~1600°C(0~16.771mV)	−100~0°C(−3.378~0mV) 0~200°C (0~9.286mV) 0~400°C (0~20.869mV)
Input System		Floating						
Input Impedance		Almost infinite						
Accuracy	*1	±0.45% (23°C)	±0.2% (23°C), Temperature coefficient; ±0.03%/°C max.					
Dead Band		±0.1%						
Linearizer		Linearity; ±0.8%	Linearity; ±0.25	Linearity; ±0.25	Linearity; ±0.25	Linearity; ±0.45	Linearity; ±0.35	Linearity; ±0.25
Cold Junction Compensator	*2	Accuracy ±1.2°C (5°C ~ 40°C)						
Superimposing Event Marker		Amplitude; 3.5 ± 1 graduation, Time; 0.2 ~ 0.4 sec. (set at frame side)						
Calibration Voltage	*3	Voltage; +1.208mV (1.241mV − 0.033mV)	Voltage; +13.419mV	Voltage; +10.777mV	Voltage; +16.395mV	Voltage; +3.407mV	Voltage; +3.260mV	Voltage; −3.378mV
		Accuracy; ±0.2% (23°C), Temperature coefficient; ±0.007%/°C						
Noise Rejection	CMRR	DC Above 160dB AC (50/60Hz) Above 160dB						
	NMRR	AC (50/60Hz) Above 64dB						
Temperature Characteristics		(Max. sensitivity range. 30 min. Warm-up) 1) Warm-up; Less than ±0.5% (at constant room temperature) 2) After warm-up; Less than ±0.15%/10°C						
Environment	*4	Temperature; 0 to 45°C, Humidity; 45 to 85%						
Weight		620g						
Accessories		Switch cap; (Red, green, white) 1 each Color sheet; (Red, green, white) 1 each						

NOTES:

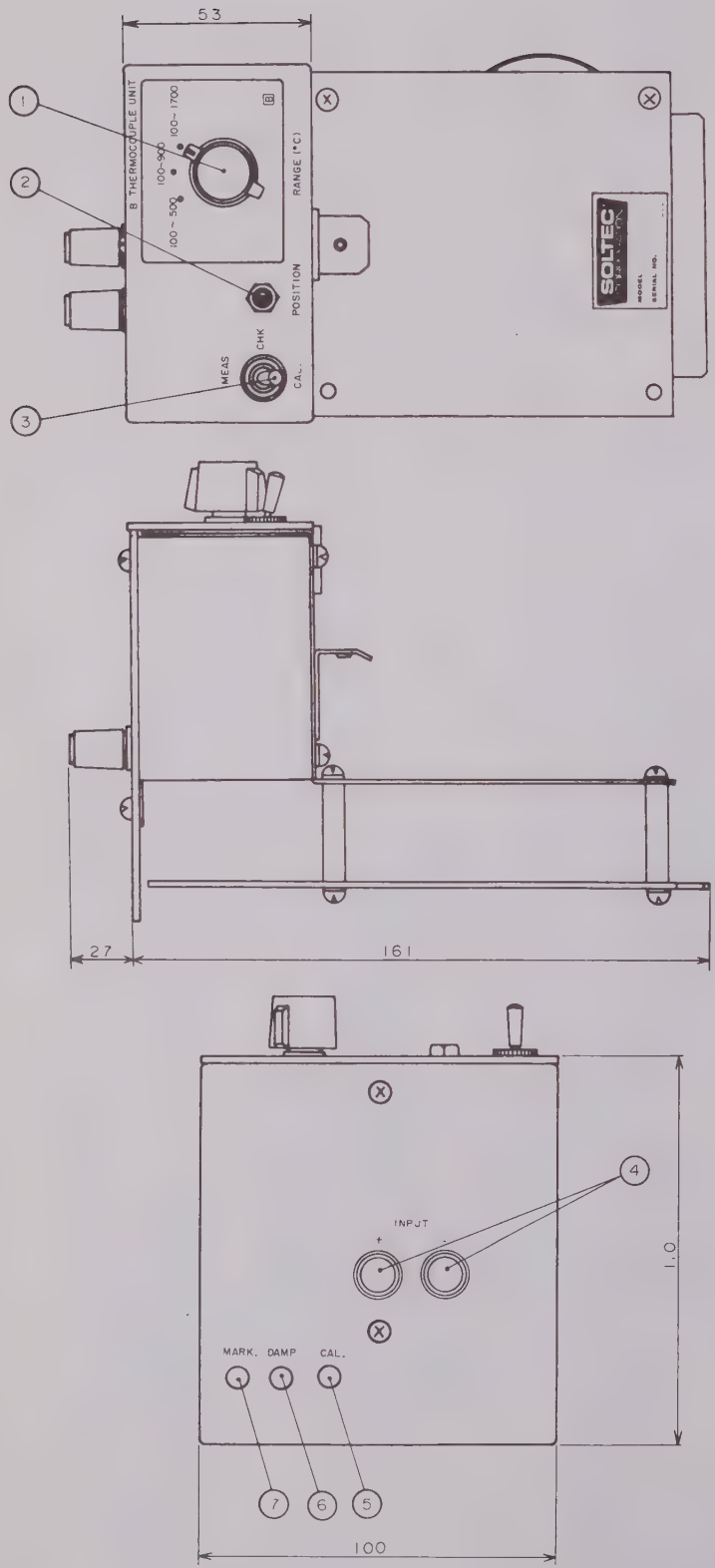
The specification for each item shows the specification of the unit assembled with the applicable mainframe.

*1 Accuracy of full span voltage calibration by using the built-in calibration voltage when assembled with the applicable mainframe (linearity is excluded).

*2 With INT./EXT. selection switch.

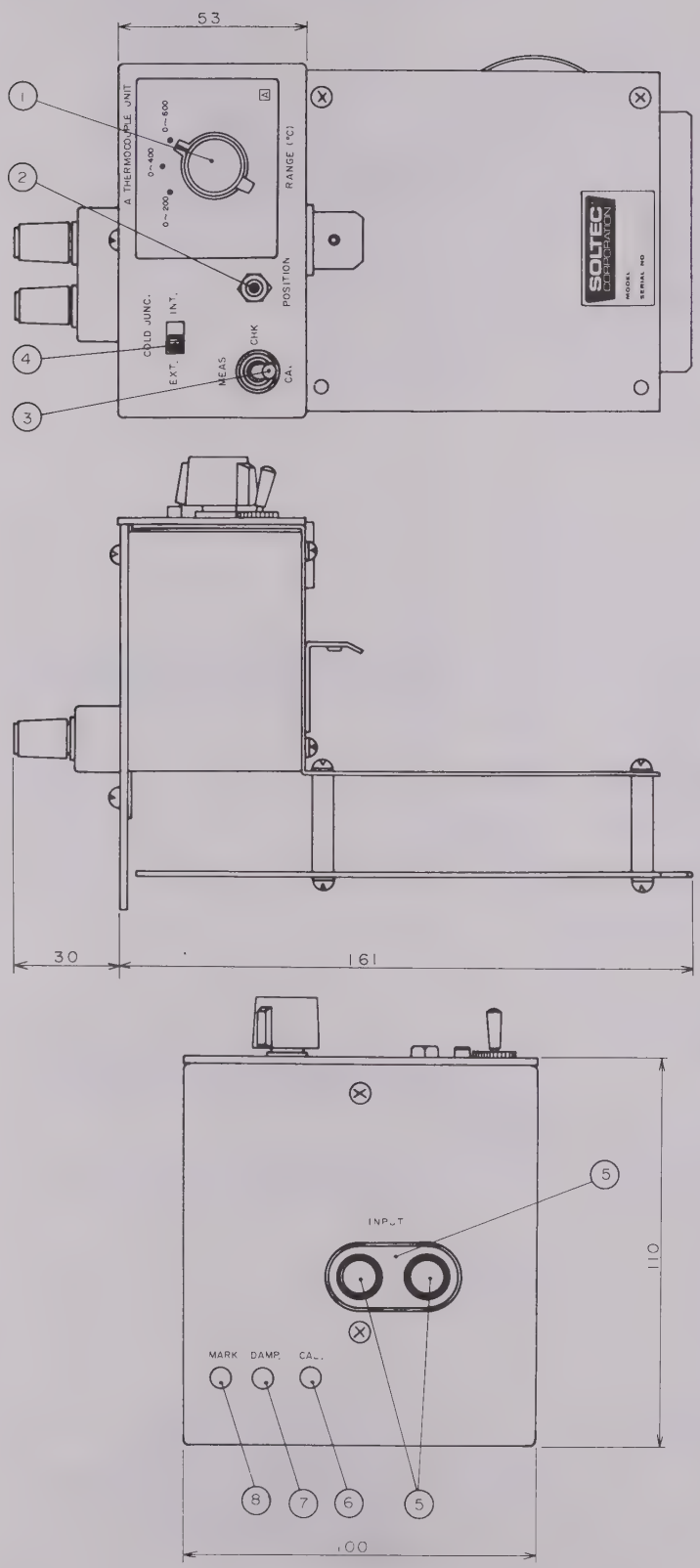
*3 Equivalent to F.S. voltage at the maximum sensitivity range.

*4 The values for ideal operational environmental are shown. The recorder can be also operated at humidities from 10% to 95%.



No.	Descriptions
1	Measuring range selection switch
2	Position control
3	MEASURE/CHECK/CALIBRATE switch
4	Input terminals
5	Full span calibrator
6	Damping control
7	Marker amplitude adjuster

Fig. 3.7 External View of MODULE 1 Thermocouple/Temperature Input Module

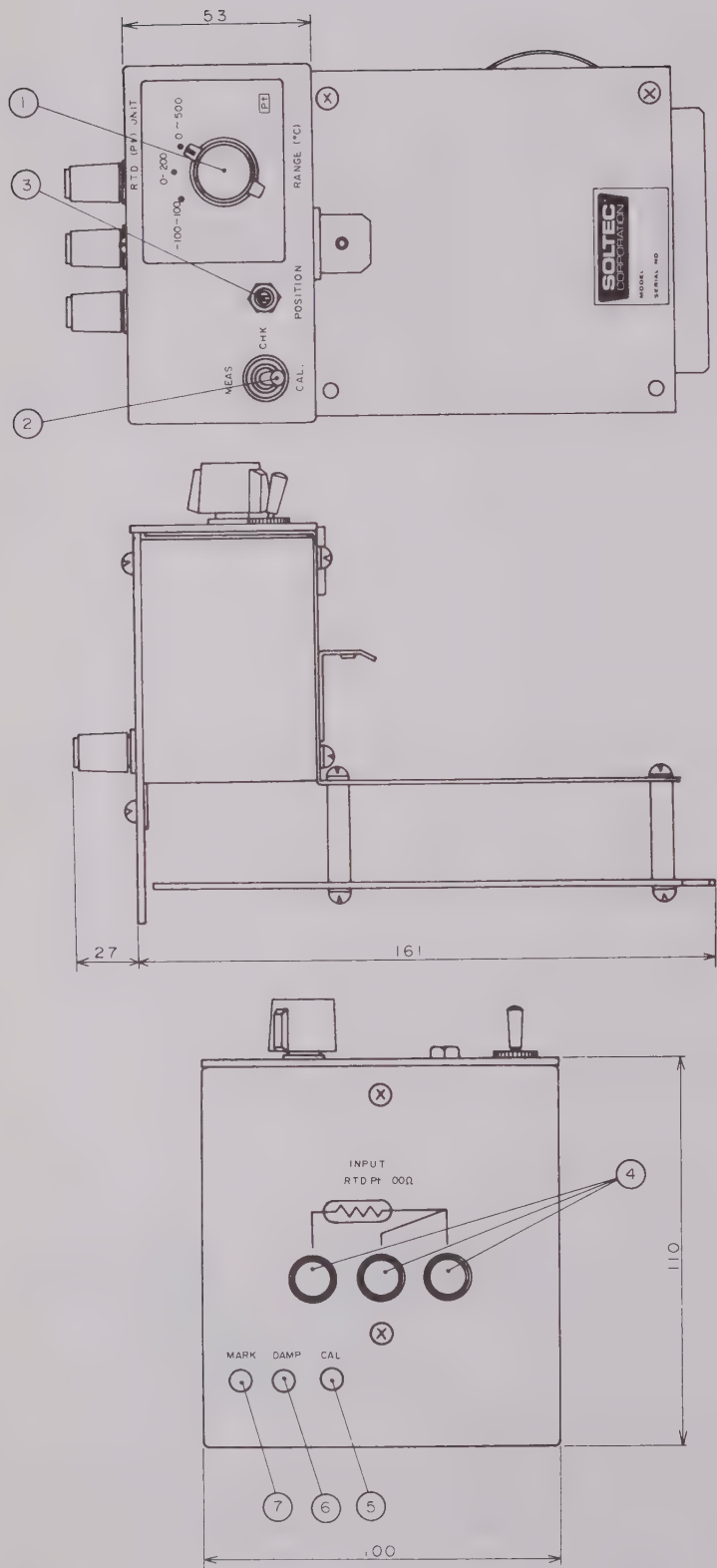


No.	Descriptions
1	Measuring range selection switch
2	Position control
3	MEASURE/CHECK/CALIBRATE switch
4	Cold junction compensation selection switch
5	Input terminals
6	Full span calibrator
7	Damping control
8	Marker amplitude adjuster

Fig. 3.8 External View of MODULE 2, 3, 4, 5, 6 and 7 Thermocouple/ Temperature Input Module (Example of MODULE 3)

NOTES:

(1) The panel differs slightly depending on the model.
(2) Refer to Fig. 3.9 for MODULE 8.



No.	Descriptions
1	Measuring range selection switch
2	MEASURE/CHECK/CALIBRATE switch
3	Position control
4	Input terminals
5	Full span calibrator
6	Damping control
7	Marker amplitude adjuster

Fig. 3.9 External View of MODULE 8 RTD/Temperature Input Module

3.3 SPECIFICATIONS OF OPTIONS

3.3.1 Chart Take-up

Applied Model	1241	1242	1243
Model Number	OPTION 1		
Applied Recording Paper	NO. RN2-01-25-20M		
Additional Power Consumption	5VA		
Changes on External Appearance	• Chart take-up switch is provided on the right sleeve plate. • Chart base plate is divided into two sections.		
Accessories	Take-up chart bobbin 1 pc. Chart holder 1 set		

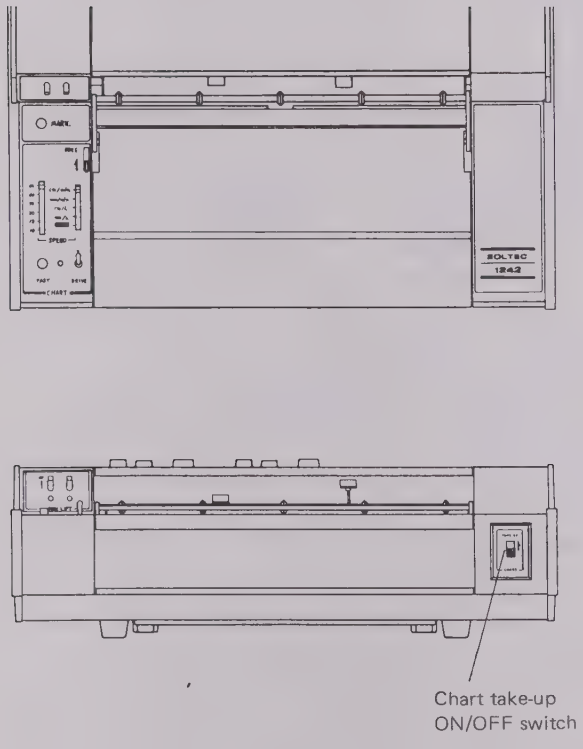


Fig. 10 External View of Models 1241–2 with Chart Take-up

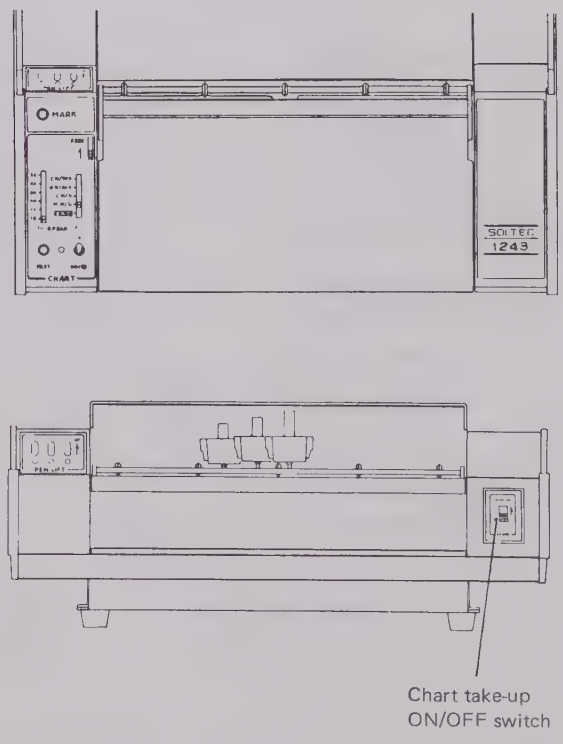


Fig. 11 External View of Model 1243 with Chart Take-up

3.3.2 Event Marker (Separate Pen)

Applied Model		1241	1242	1243
Model Number		OPTION 2		
Reference Position	X-axis	Marker space at the right end of chart paper		
	T-axis	4mm forward of recording pen	The same position with channel 2 pen	4mm backward of channel 1 recording pen
Amplitude		2 ± 0.5mm to left from the reference position		
Operation Method		TTL input or contact closure from the remote control connector. Swings off to left at low level.		
Marker Pen		Cartridge type fiber tip pen		
Pen Lift		Interlocked with recording pen	Interlocked with channel 2 record-ing pen	Interlocked with channel 1 recording pen
Additional Power Consumption		2VA		
Additional accessories		Marker pen PF-1211 ..... 1 pc.		

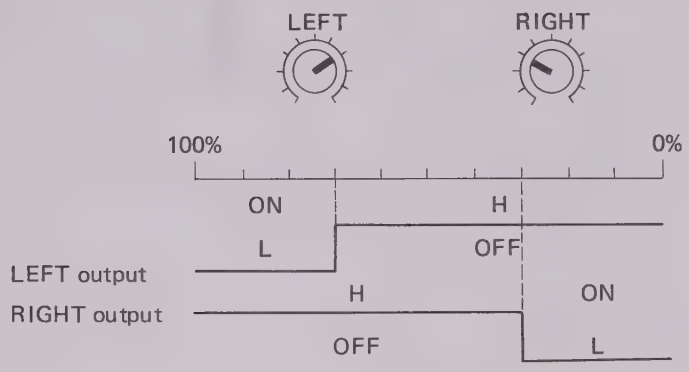
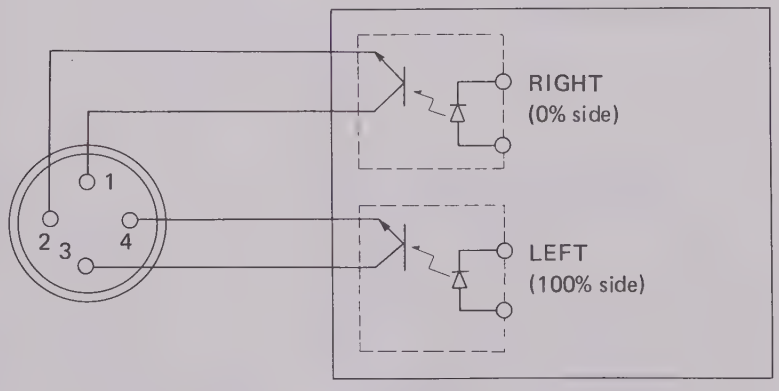
3.3.3 Electric Pen Lift

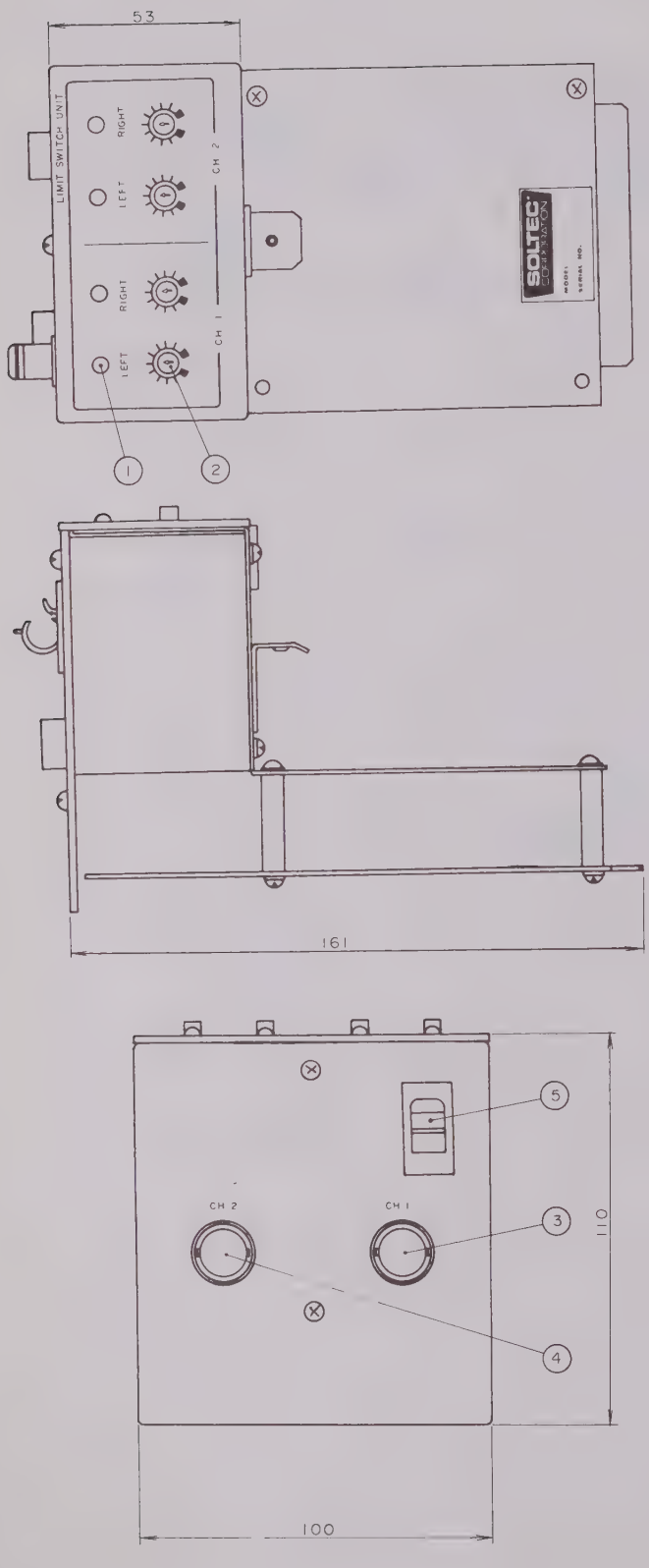
Applied Model	1241	1242	1243
Model Number	OPTION 3	OPTION 3	OPTION 4
Operation System	Individual	Individual or Simultaneous	Simultaneous
Panel Control	Pen Lift Lever		
Remote Control *1	TTL input or contact closure.	High; pen-up Low; pen-down	
Additional Power Consumption	2VA	4VA	2VA

NOTE:

*1 Refer to 4.4 Remote Control Connector Unit for remote control connectors.

3.3.4 Electronic Limit Switch

Applied Model	1241	1242	1243-S
Model Number	OPTION 5	OPTION 6	OPTION 7
System	Variable type, one each for Left and Right, Total 2 per channel		
Operation	 L; Output—LOW, Limit Alarm Lamp—lights H; Output—HIGH, Limit Alarm Lamp—goes off		
Setting Range	0 ~ 100% (Both RIGHT and LEFT)		
Hysteresis	Less than 0.5%		
Output System	Opto Coupled Isolator Maximum ratings: 100mW (30V, 50mA)		
Circuit Configuration	 Output connector Limit switch circuit		

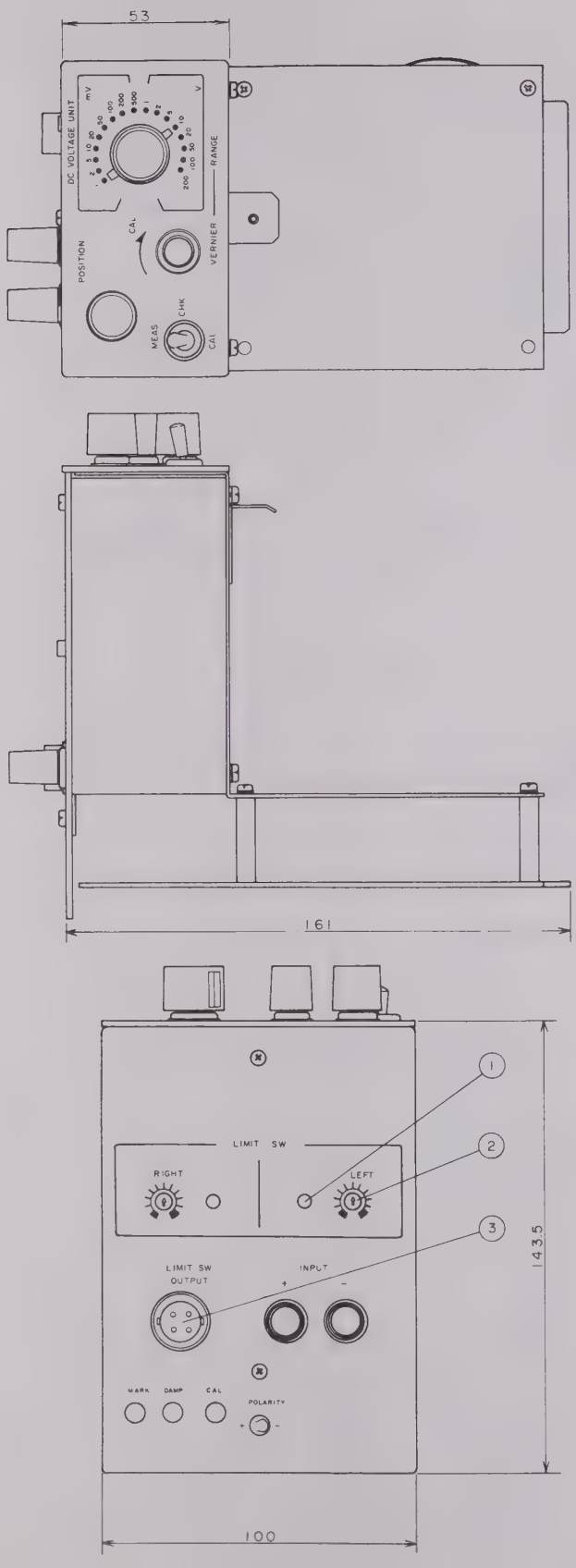


No.	Descriptions
1	Limit alarm lamp
2	Limit control
3	Limit switch output connector CH. 1
4	Limit switch output connector CH. 2
5	Cord clamp

Fig. 3.12.1 External View of OPTION 6 Electronic Limit Switch

NOTE:

The channel 2 connector, Limit control and Limit alarm lamp are not provided with the 1241 unit.



No.	Description
1	Limit alarm lamp
2	Limit control
3	Limit switch output connector

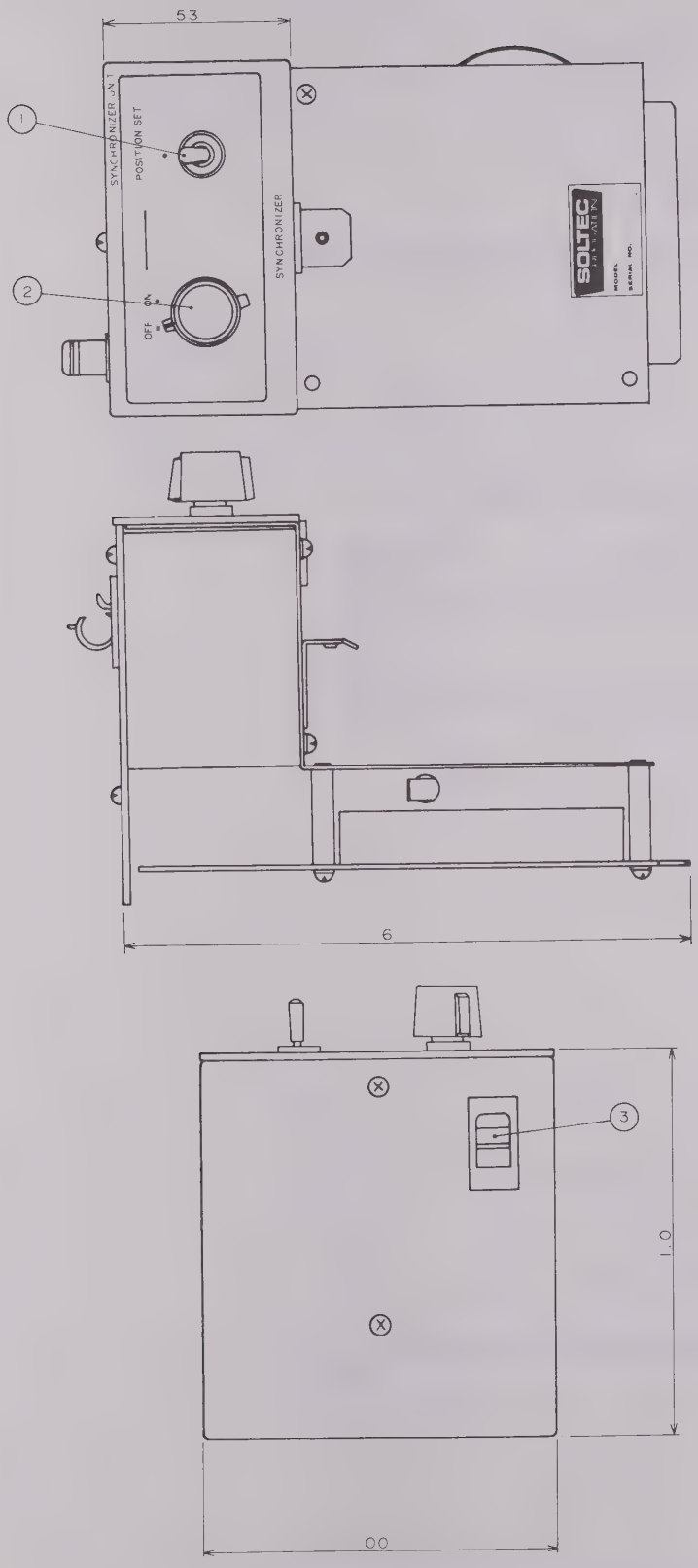
Fig. 3.12.2 External View of OPTION 7 Electronic Limit Switch

3.3.5 Synchronizer

Applied Model	1242	1243
Model Number	OPTION 10	OPTION 11
System	An analog signal is received from the servo amplifier and converted into a digital code, which is written into a shift register. It is then output and converted into an analog signal for recording.	
Accuracy	±0.11% (23°C)	
Linearity	±0.06% (23°C)	
Resolution	Approx. 0.275mm (0.11%)	
Resolution of Time Axis	Approx. 0.033mm (120 words/4mm)	Approx. 0.067mm (Channel 2; 60 words/4mm Channel 3; 120 words/8mm)
Synchronizer Switch	Standard	
Zero Point Setting Switch	Standard feature In case synchronizer switch is "ON", this switch facilitates the zero point adjustment.	
Time Axis Fine Adjuster	None	Standard feature When set to "+" direction, time lag is lengthened and the movement of pen is delayed. When set to "−" direction, the opposite takes place. Resolution: Approx. 0.13mm/step Adjustment range: Approx. ±0.9mm (±7 steps)
Additional Power Consumption	3.5VA	7VA
Weight	600g	1.5kg
External Dimensions	100(W) X 110(H) X 161(D)	430(W) X 198(H) X 410(D) *1

NOTE:

*1 These are the dimensions when the synchronizer is installed on a 1243.



No.	Descriptions
1	Zero point switch
2	Synchronizer switch
3	Cord clamp

Fig. 3.13 External View of OPTION 10 Synchronizer for Model 1242

No.	Descriptions
1	Synchronizer switch
2	Zero point switch
3	Channel 2 time axis vernier
4	Channel 3 time axis vernier
5	The section where printed circuit board of synchronizer is attached.

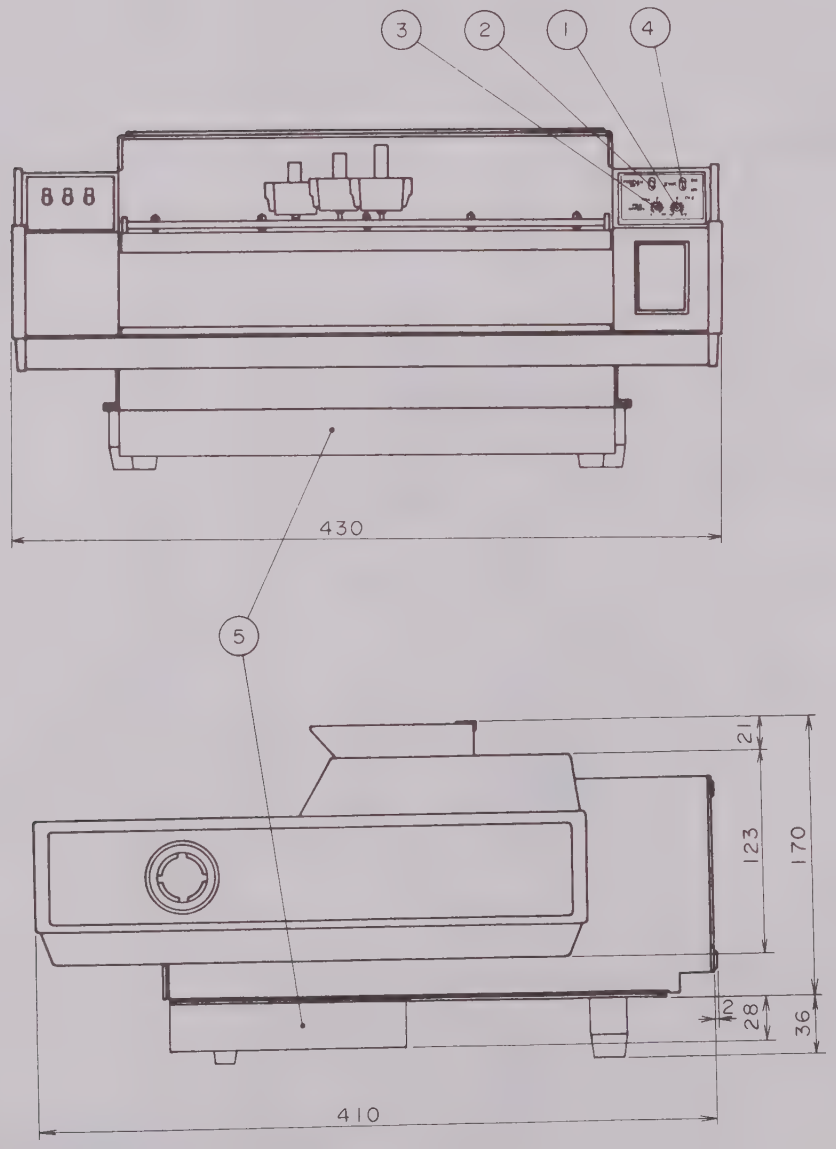


Fig. 3.14 External View of Model 1243 with OPTION 11 Synchronizer

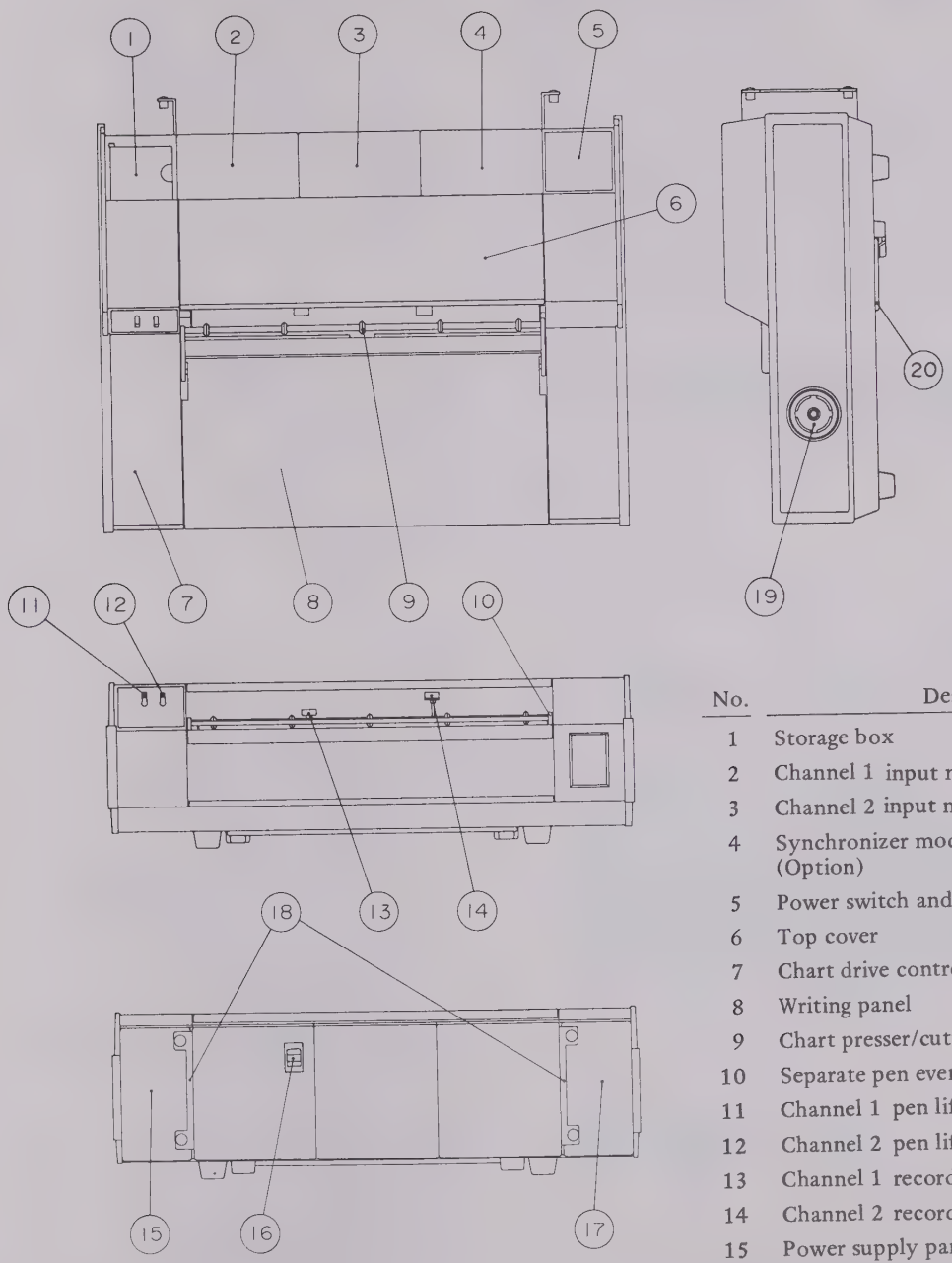
3.3.6 Retransmitting Potentiometer Output

Applied Model	1241	1242	1243
Model Number	OPTION 12		
Operation Method	A dual potentiometer is mounted on the servo unit. One potentiometer is used as a servo potentiometer and the other is used as a retransmitting potentiometer.		
Resistance	5kΩ ± 15%		
Linearity	±0.3%		
Temperature Coefficient	±400ppm/°C		
Mechanical Angle	340° ± 2°		
Capacity	1W		
Allowable Maximum External Voltage	70V max.		

SECTION 4

DESCRIPTION OF CONTROLS AND PARTS LOCATIONS

4.1 PART LOCATIONS

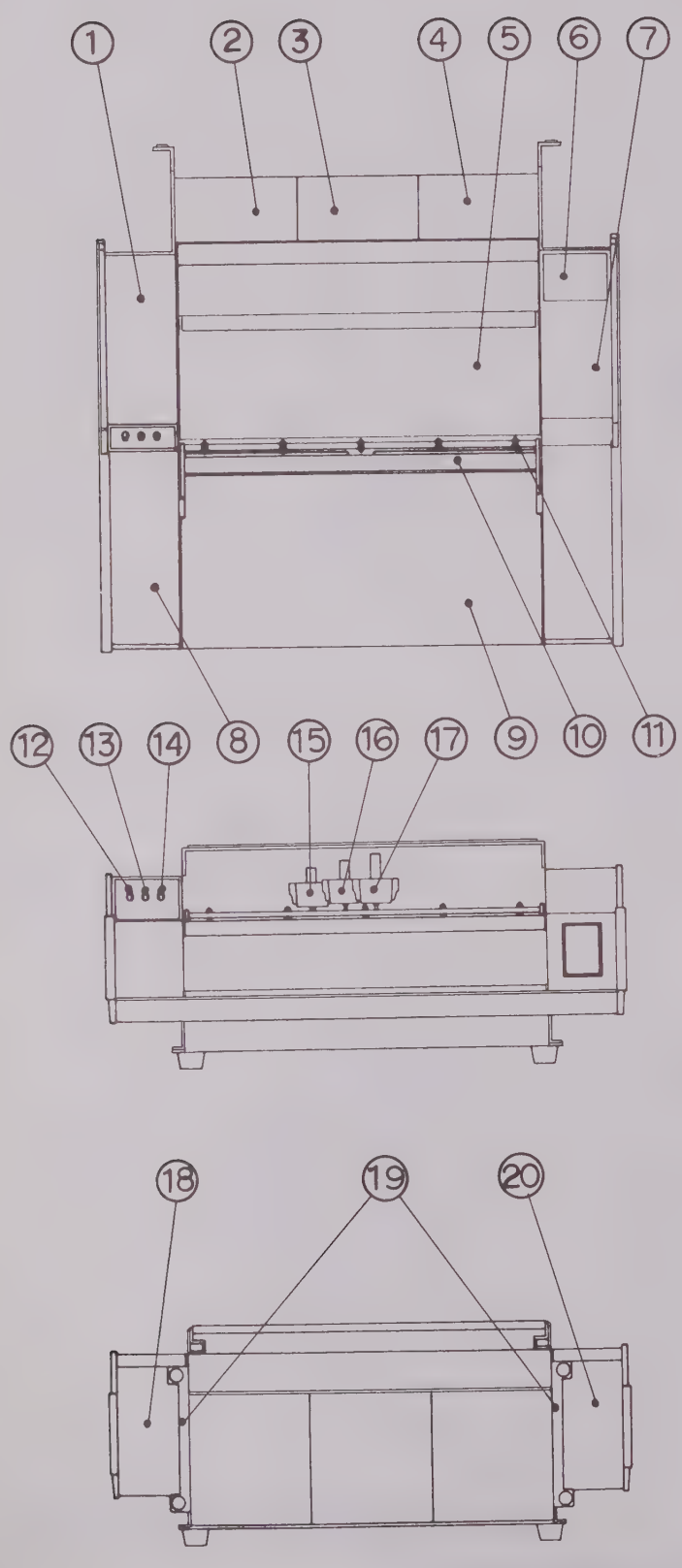


No.	Description
1	Storage box
2	Channel 1 input module
3	Channel 2 input module
4	Synchronizer module or Limit switch module (Option)
5	Power switch and Indicator lamp
6	Top cover
7	Chart drive control panel
8	Writing panel
9	Chart presser/cutter
10	Separate pen event marker (Option)
11	Channel 1 pen lift lever
12	Channel 2 pen lift lever
13	Channel 1 recording pen
14	Channel 2 recording pen
15	Power supply panel
17	Remote control connector
18	Cord holder
19	Manual chart rewind wheel
20	Tilt stand

NOTE:

For model 1241, delete input module, pen lift lever and recording pen for the second channel.

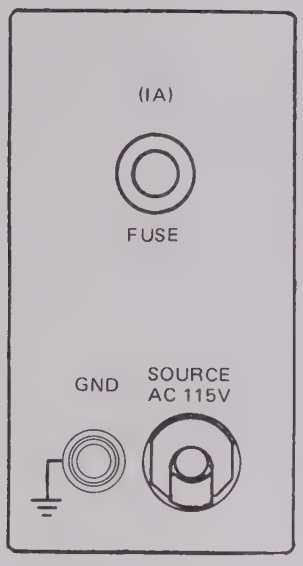
Fig. 4.1.1 Part Locations, 1241–2



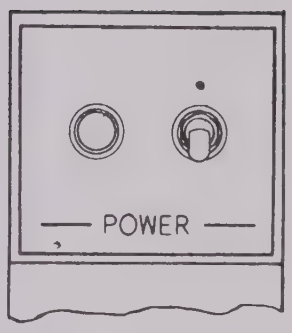
No.	Description
1	Top sleeve plate (left)
2	Channel 1 input module
3	Channel 2 input module
4	Channel 3 input module
5	Top cover
6	Power switch and Indicator lamp
7	Top sleeve plate (right)
8	Chart drive control panel
9	Writing panel
10	Separate pen event marker (Option)
11	Chart presser/cutter
12	Channel 1 pen lift lever
13	Channel 2 pen lift lever
14	Channel 3 pen lift lever
15	Channel 1 recording pen
16	Channel 2 recording pen
17	Channel 3 recording pen
18	Power supply panel
19	Cord holder
20	Remote control connector
21	Manual chart rewind wheel

Fig. 4.1.2 Part Locations, 1243

4.2 POWER SUPPLY



(a) Rear View



(b) Top View

Power Switch and Power Indicator Lamp	Controls power to recorder. Power indicator lamp lights with switch at "ON".
Ground Terminal GND	Connects to chassis ground internally. Connect this to chassis ground of peripheral equipment to reduce noise and protect operator from electrical shock.
Fuse	Protects recorder from certain malfunctions.

Fig. 4.2 Power Supply Panel

4.3 CHART DRIVE CONTROL PANEL

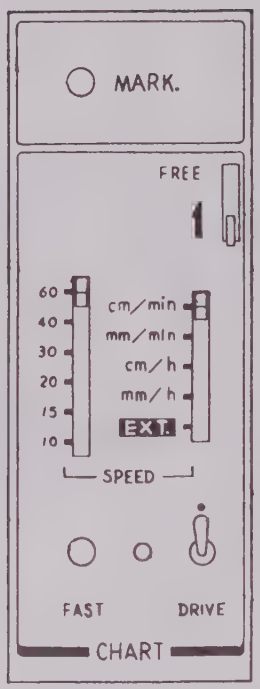


Chart Drive Switch DRIVE and Indicator Lamp	When this switch is set to ON position, indicator lamp lights and chart paper advances.
Chart Fast Switch FAST	When depressed, chart advances at speed of 60cm/min regardless of position of CHART DRIVE or CHART SPEED switches.
Chart Speed Selection Switch SPEED	Selects chart speed as desired.
Chart Speed Unit Selection Switch SPEED	Selects the unit of chart speed as desired. EXT. position transfers control of speed of to external pulse input.
Chart Free Lever FREE	Disengages chart drive clutch in FREE position, allowing use of manual rewind wheel.
Event Marker Pushbutton MARK.	Depressing this pushbutton causes a small signal to be superimposed on the recorded trace.

Fig. 4.3 Chart Drive Control Panel

4.4 REMOTE CONTROL CONNECTOR

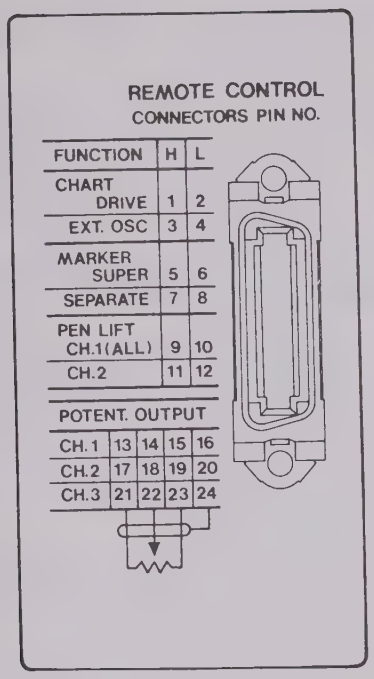


Fig. 4.4 Remote Control Connector Unit Panel

Remote Control Connector Unit

Pins	Description	Functions
1, 2	Chart Drive Remote Control Pins CHART DRIVE	Shorting or supplying TTL low level to these pins causes chart to drive at the speed selected on front panel; front panel CHART DRIVE switch must be at off position (light off).
3, 4	External Chart Drive Pins EXT. OSC	Used to control chart speed by external generator. Refer to "chart speed" specifications in item 3.1. Front panel CHART SPEED switch must be set to EXT.
5, 6	Event Marker Remote Control Pins MARKER SUPER	Shorting or supplying TTL low level to these pins will cause a small signal to be superimposed on the recorded trace.

Optional Features Controlled by Remote Connector

7, 8	Separate Pen Event Marker Remote Control Pins MARK. SEPARATE	Shorting or supplying TTL low level to these pins will result in operation.
9, 10	Electric Pen Lift Remote Control Pins PEN LIFT CH. 1 (ALL)	Operator panel pen lift switch must be in the up position. 1241, 1242 (with separate pen lift): Shorting or supplying TTL low level to these pins will lower the CH. 1 pen. 1242 (simultaneous pen lift): Shorting or supplying TTL low level to these pins will lower both pens. 1243 (simultaneous pen lift): Shorting or supplying TTL low level to these pins will lower CH. 1, CH. 2 and CH. 3 pens simultaneously.
11,12	Electric Pen Lift Remote Control Pins PEN LIFT CH. 2	Only for 1242 (with separate pen lift): Shorting or supplying TTL low level to these pins will lower the CH. 2 pen.
13, 14, 15, 16	CH. 1 Potentiometer Output POTENT. OUTPUT CH. 1	Pins connect to retransmitting potentiometer(s) which are mechanically coupled to the rebalancing potentiometer of each channel. Each potentiometer is electrically isolated from input signals and from other recorder circuits. See drawing on connector panel for connection and phasing. The pen moves left (operator standpoint) as the wiper approaches pins 13, 17 and 21.
17, 18, 19, 20	CH. 2 Potentiometer Output POTENT. OUTPUT CH. 2	
21, 22, 23, 24	CH. 3 Potentiometer Output POTENT. OUT CH. 3	

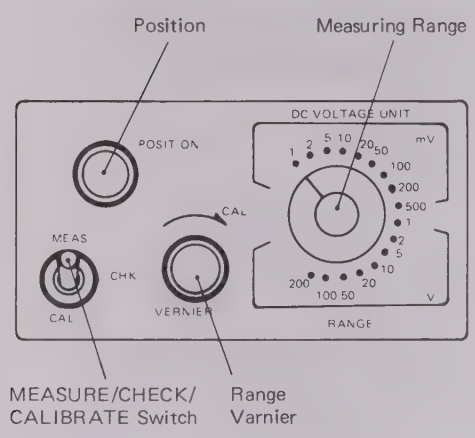
The even numbered pins up to pin 12 are connected in common to ground. The odd pins are the input.

4.5 OTHERS

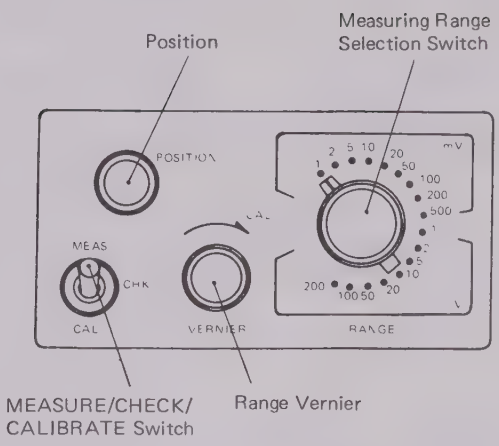
1	Pen Lift Lever(s) (Standard)	Raises & lowers pens. One lever provided for each pen.
2	Pen Storage Box	For storage of pens and pen caps.
3	Chart Paper Cutter	For cutting chart paper. Press center of cutter with finger and tear chart paper using other hand.
4	Chart Manual Rewind Wheel	Rewinds chart on source reel. Set CHART FREE lever to FREE. Pull rewind wheel out and turn clockwise to rewind chart.

4.6 INPUT MODULES

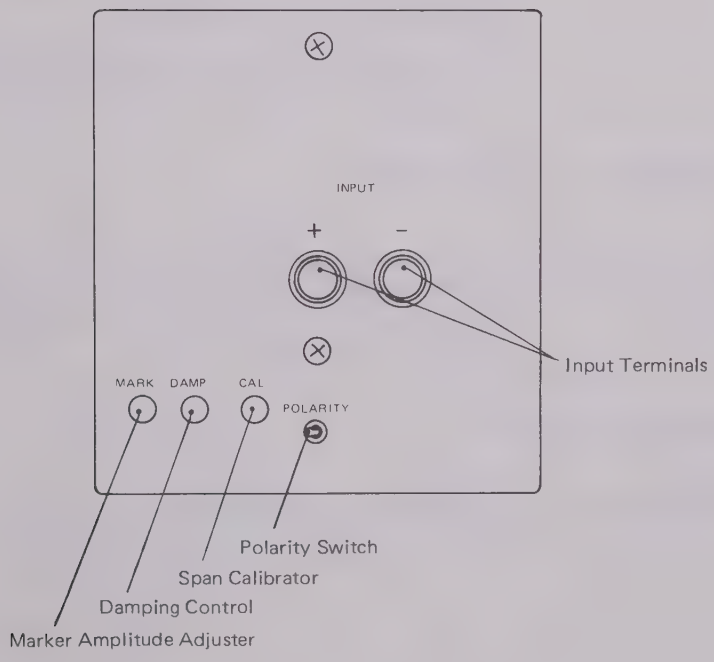
MODULE A:
(Example of 1mV F.S.)



MODULE B:



(a) Top View



(b) Rear View

Fig. 4.5 DC Voltage Input Module Panel

4.6.1 Description of Input Module Controls

Measuring Range	Indicates the full span of fixed range modules.
RANGE switch	Selects input range of channel. Selected RANGE is accurate only when VERNIER control is at CAL.
VERNIER	Expands measuring range up to 2.5 times RANGE selected. Not applicable to temperature modules.
POSITION	Establishes the zero position of the recording pen. CW rotation causes pen deflection to right. Authority of control is ±100% F.S. from zero on the chart.
MEAS.-CHK-CAL. switch	At CHK position, the circuit is grounded and the pen position represents zero input; use POSITION control to adjust the pen to the desired position. At MEAS. position, the pen responds to the voltage at input terminals. At CAL. position, an internal precision source equivalent to full span input connects to channel input, allowing calibration check.
Input Terminals INPUT, +, −	Connections for signal to be measured.
POLARITY switch	Determines direction of pen response. With a positive voltage at + INPUT terminal, pen moves right when POLARITY switch is at "−" and left when at "+".
CAL	For adjustment of full scale span. Refer to Section 6.2 for procedure.
DAMP.	Adjusts damping characteristics of pen system. Refer to Section 6.3 for procedure.
MARK	For adjusting amplitude of marker superimposed on recording trace. Amplitude increases as this control is turned clockwise.

Thermocouple/Temperature Input Modules

Cold Junction Compensator Selection Switch COLD JUNC.	Selects internal (INT.) or external (EXT.) cold junction compensator. At position EXT., the internal compensator is disabled and an external compensator may be used or an external calibration source may be used to check module calibration.

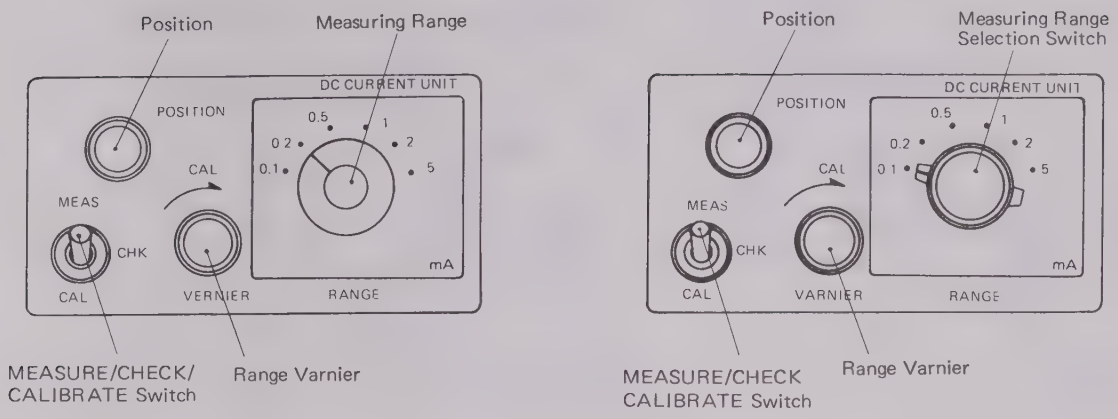
RTD/Temperature Input Module

Input Terminals INPUT/RTD 100Ω	Connection point for RTD sensor. Connect per diagram on rear panel of module.

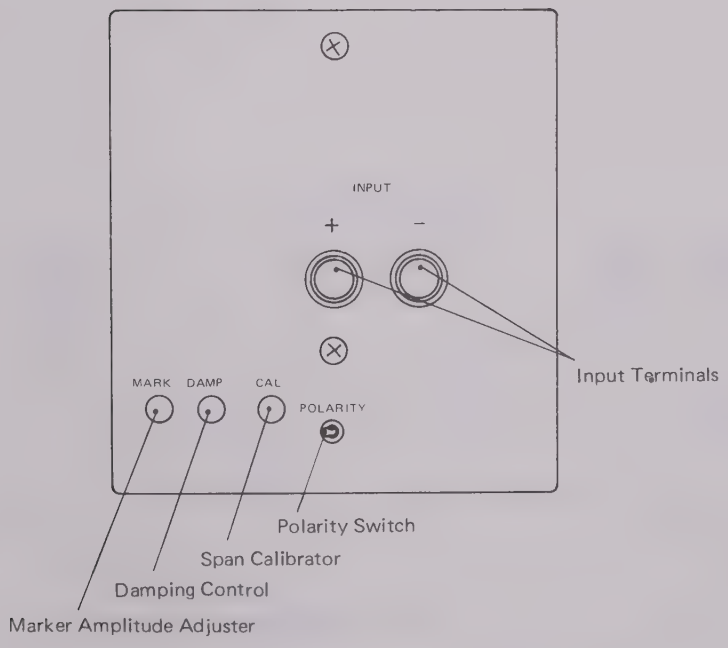
4.6.2 DC Current Input Modules

MODULE C:
(0.2mA F.S. shown)

MODULE D, E or F:
(MODULE E shown)



(a) Top View



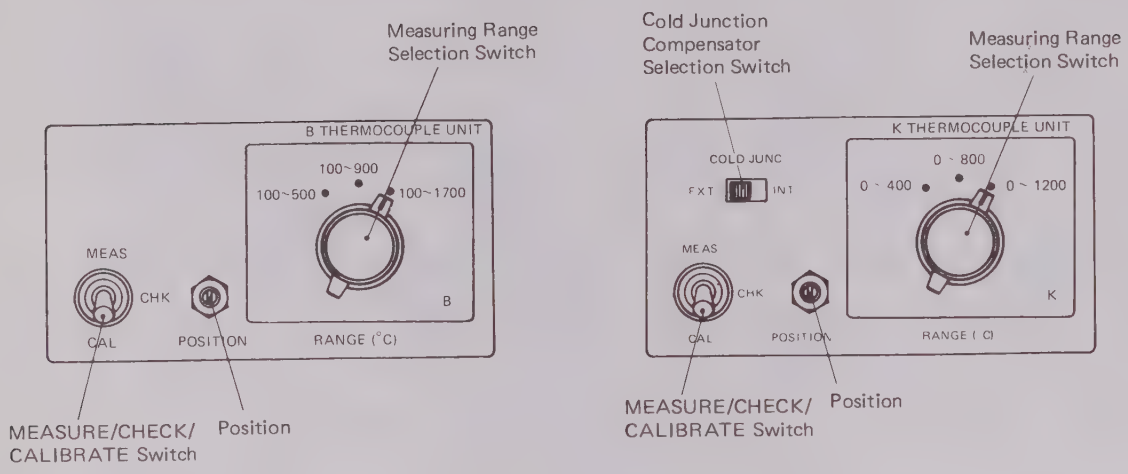
(b) Rear View

Fig. 4.6 DC Current Input Module Panel

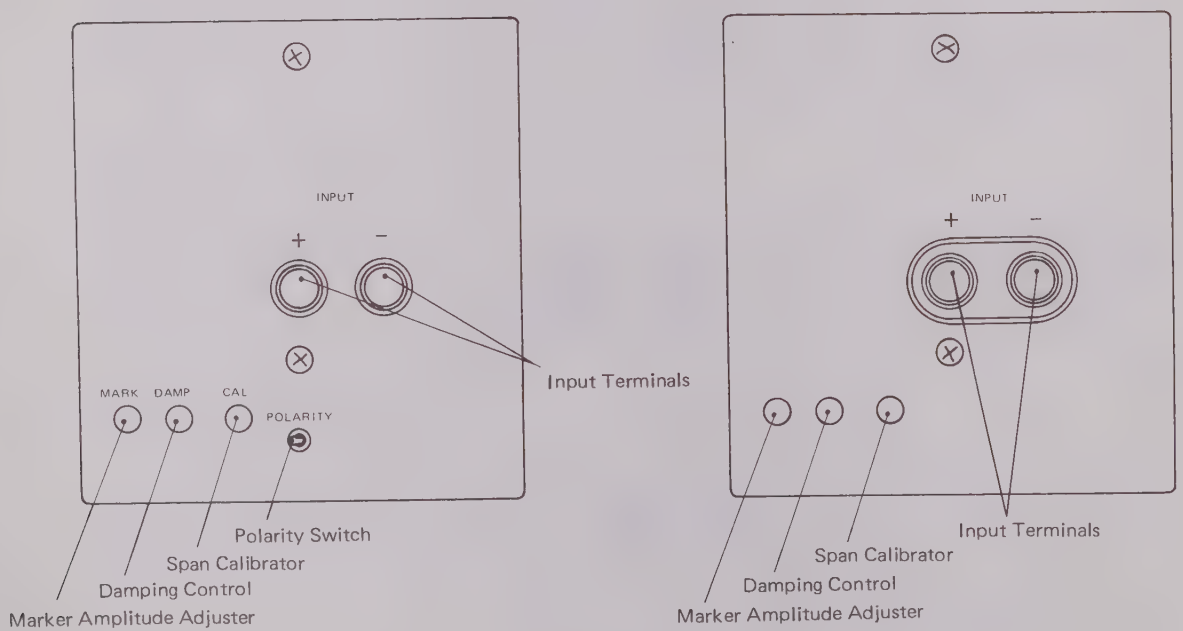
4.6.3 Thermocouple/Temperature Input Modules

MODULE 1:

MODULE 2, 3, 4, 5, 6 or 7:
(MODULE 4 shown)



(a) Top View

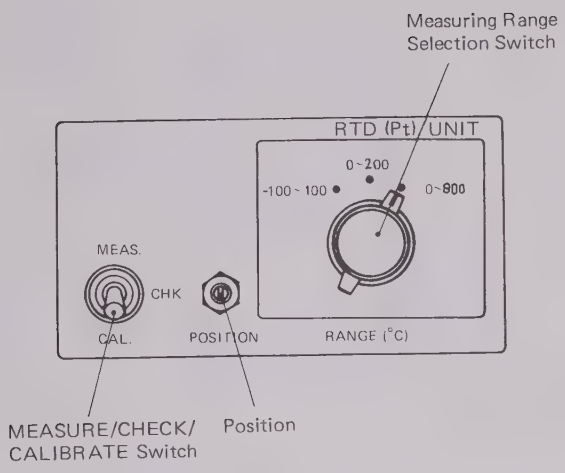


(b) Rear View

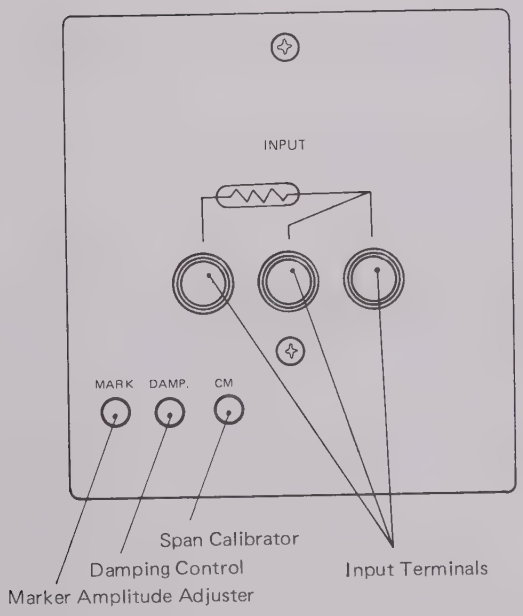
Fig. 4.7 Thermocouple/Temperature Input Module Panel

4.6.4 RTD/Temperature Input Module

MODULE 8:



(a) Top View



(b) Rear View

Fig. 4.8 RTD/Temperature Input Module Panel

4.7 OPTIONS

4.7.1 Chart Take-up, 1241–3

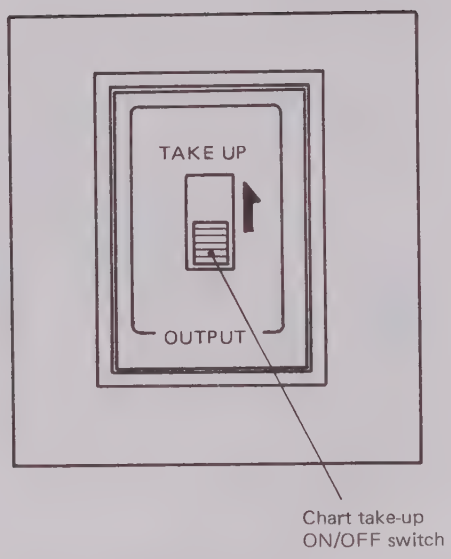
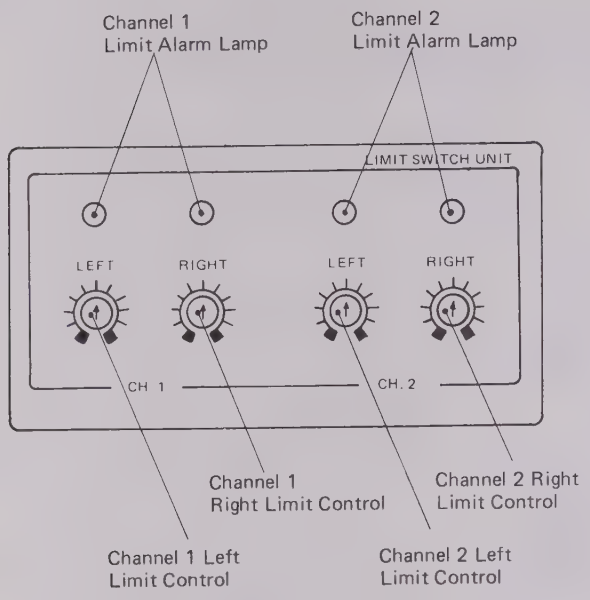


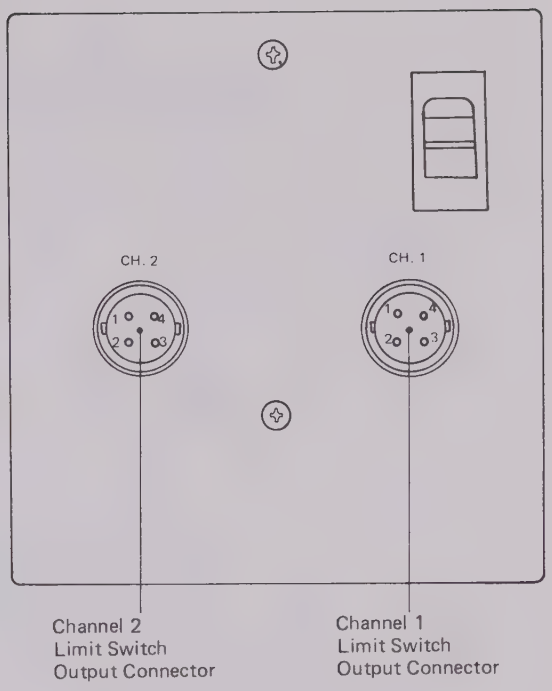
Chart Take-up ON/OFF Switch TAKE UP	Enables or disables the chart take-up motor. Refer to section 5.2.3 for operation instructions.

Fig. 4.9 Chart Take-up Control Panel, 1241–3

4.7.2 Electronic Limit Switch, 1241–2



(a) Top View



(b) Rear View

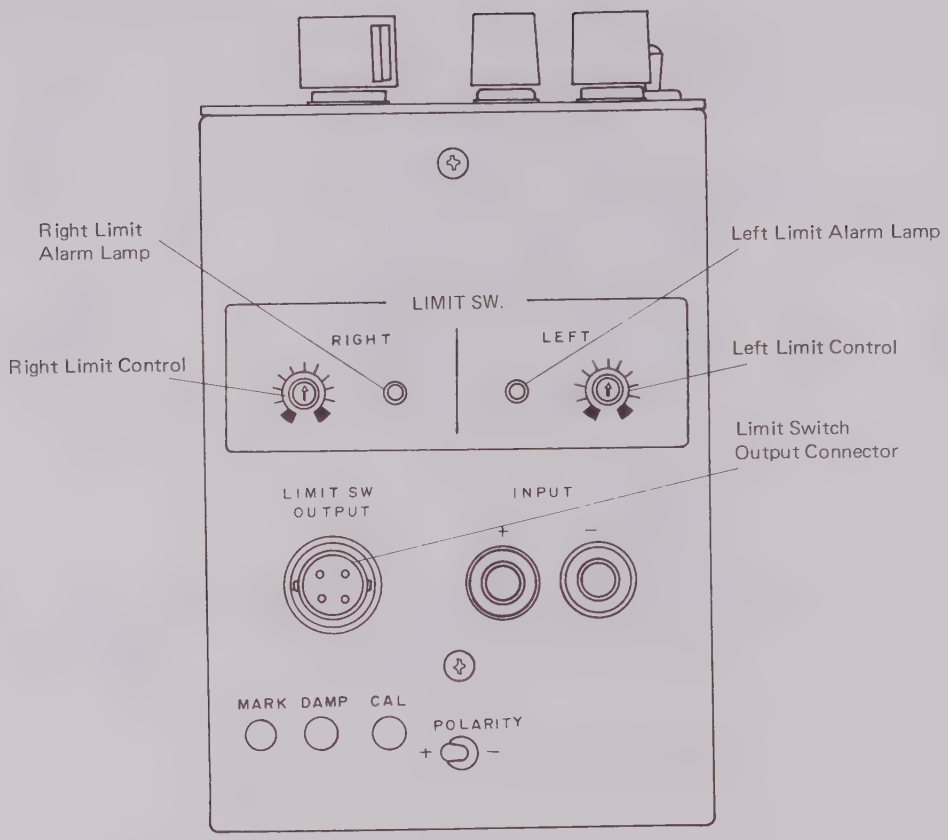
(Note)

Lamp, control and connector for channel 2 are not provided for model 1241.

Adjustment Procedure	Set recording pen at desired left limit position and rotate LEFT limit switch control until limit alarm lamp lights. Repeat for right limit position. This complete the setting of the limit switch.

Fig. 4.10.1 Electronic Limit Switch Panel, 1241–2

4.7.3 Electronic Limit Switch, 1243



NOTE:

If limit switch for 3 pen recorder required, contact SOLTEC.

Adjustment Procedure	(same text as 1241–2)

Fig. 4.10.2 Electronic Limit Switch, 1243 (Input Module)

4.7.4 Synchronizer, 1242

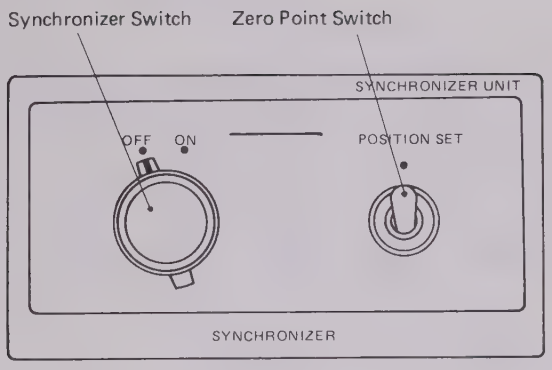


Fig. 4.11 Synchronizer Control Panel, 1242

Synchronizer Switch OFF/ON	Enables or disables synchronizer. OFF: Disables synchronizer Other operations are identical to model 1242. ON: Enables synchronizer
Zero Point Switch POSITION SET	Allows adjustment of zero position when the synchronizer is used. Set this switch at the ON position, adjust zero point using the position control on the input module, set the switch at OFF position, and then start recording.

NOTES:

(1) The zero point may be slightly different with synchronizer OFF and ON.
Be sure to check the zero point on channel 2 when the synchronizer operating mode is changed.

(2) When the power switch or synchronizer switch are initially turned to the ON position, the channel 2 pen will act in a random manner until the chart paper advances by 4mm.
This happens because of meaningless data in the shift register, and this does not represent any problem with the recorder.

4.7.5 Synchronizer, 1243

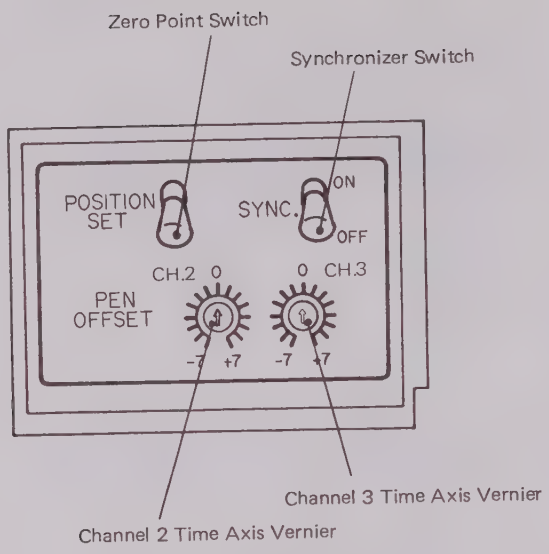


Fig. 4.12 Synchronizer Control Panel, 1243

Synchronizer Switch SYNC.	Enables or disables synchronizer. OFF: Disables synchronizer. Other operations are identical to model 1243. ON: Enables synchronizer
Zero Point Switch POSITION SET	Allows adjustment of zero position when the synchronizer is used. Set this switch at the ON position, adjust zero points, set this switch at OFF position, and then start recording.
Time Axis Vernier PEN OFFSET	Used to make small corrections in time axis caused by replacing recording pens etc. When the setting is in the + direction, the delay time is increased. When the setting is in the − direction, the delay time is decreased.

NOTES:

1. The zero points may be slightly different with synchronizer OFF and ON.
   Be sure to check the zero points on channel 2 and channel 3 when the synchronizer operating mode is changed.
2. When the power switch or synchronizer switch are initially turned to the ON position, the channel 2 and 3 pens will act in a random manner until the chart paper advances by 8mm.
   This happens because of meaningless data in the shift register, and this does not represent any problem with the recorder.

4.7.6 Retransmitting Potentiometer Output, 1241–3

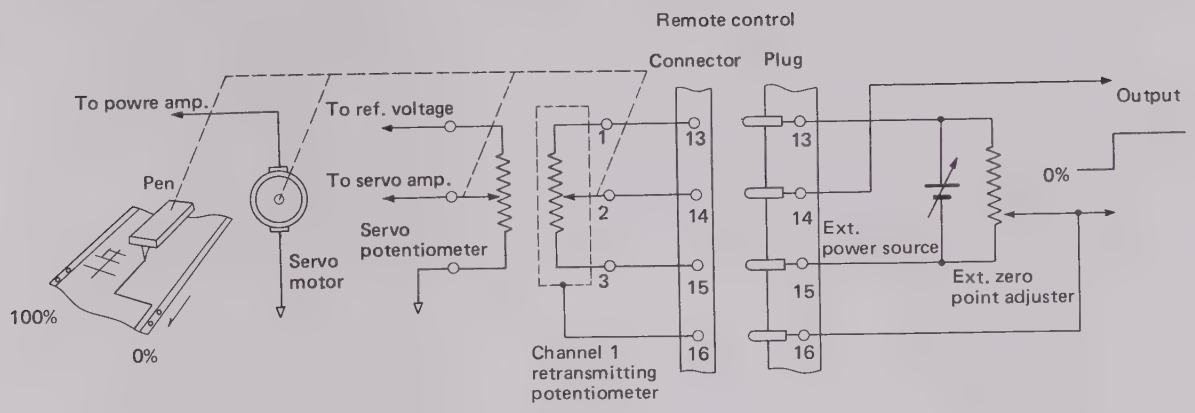


Fig. 4.13 Configuration and Application

Channel 1 Retransmitting Potentiometer	Since the potentiometer wiper is mechanically linked with the servo motor shaft, the wiper moves according to input signal change.
° External Power Source	A maximum of 70V can be applied across pins 13 and 15. Avairable voltage source must be used for compensating the 100% side of potentiometer rotating angle margin.
External Zero Point Adjuster	Used to compensate the 0% side of the retransmitting potentiometer.
Remote Control Connector	Provided at the rear of the recorder.
Remote Control Plug	Standard

SECTION 5

OPERATION

5.1 PREPARATION FOR USE

A. Set controls in the following positions:

POWER Switch	OFF
CHART DRIVE Switch	OFF
PEN LIFT Lever	UP
MEAS./CHK/CAL. Switch	CHK
RANGE Select Switch	at desired range (not required in a single range)
POLARITY	as needed

B. Ground the recorder GND terminal to earth ground.

C. Connect power cord to power source.

D. Load recording chart (refer to para. 5.2).

E. Install recording pen into pen carriage (refer to para. 5.3).

F. Connect input signal lines to the appropriate INPUT terminals on each input module.

G. Set POWER switch to ON.

H. Lower the recording pen(s) using PEN LIFT levers.

I. Adjust the recording pen(s) to zero position using POSITION control.

J. Set CHART SPEED as desired. Set CHART DRIVE to ON and CHART FREE lever down to start chart drive.

K. Set MEAS.-CHK-CAL. switch to MEAS. Recorder pens should now responding to input signal. This completes preparation procedure. When a highly accurate measurement is desired, allow 30 minutes or more of warmup prior to recording.

5.2 LOADING CHART PAPER (refer to Figs. 5.1 and 5.2)

5.2.1 Loading Roll Chart Paper (SOLTEC RN2-01-25-25M)

A. Set CHART FREE lever to FREE.

B. Open writing panel.

C. Install the fixed shaft paper flange into right side of chart core as viewed from front of recorder; install the movable shaft paper flange on the other end.

D. Install paper roll with flanges into recorder with the fixed shaft flange to the right of the recorder.

E. Turn recorder rewind wheel or chart paper to engage the slotted shaft of right flange with the rewind shaft of recorder.

F. Set CHART FREE lever to the position opposite the arrow. Pass the end of chart along chart paper guide plate and under chart drive drum while pressing CHART FAST switch. Paper will feed around drum and appear at top of drum.

G. Continue feeding chart until 5 to 10cm of the chart paper emerges above the drum. Release CHART FAST switch and close the writing panel.

H. Guide chart paper from top of drum to pass between writing panel and paper bail.

I. Ensure that the right end of chart roll is contacting right flange.

J. Check chart paper drive using CHART FAST switch.
This completes loading of chart paper into recorder.

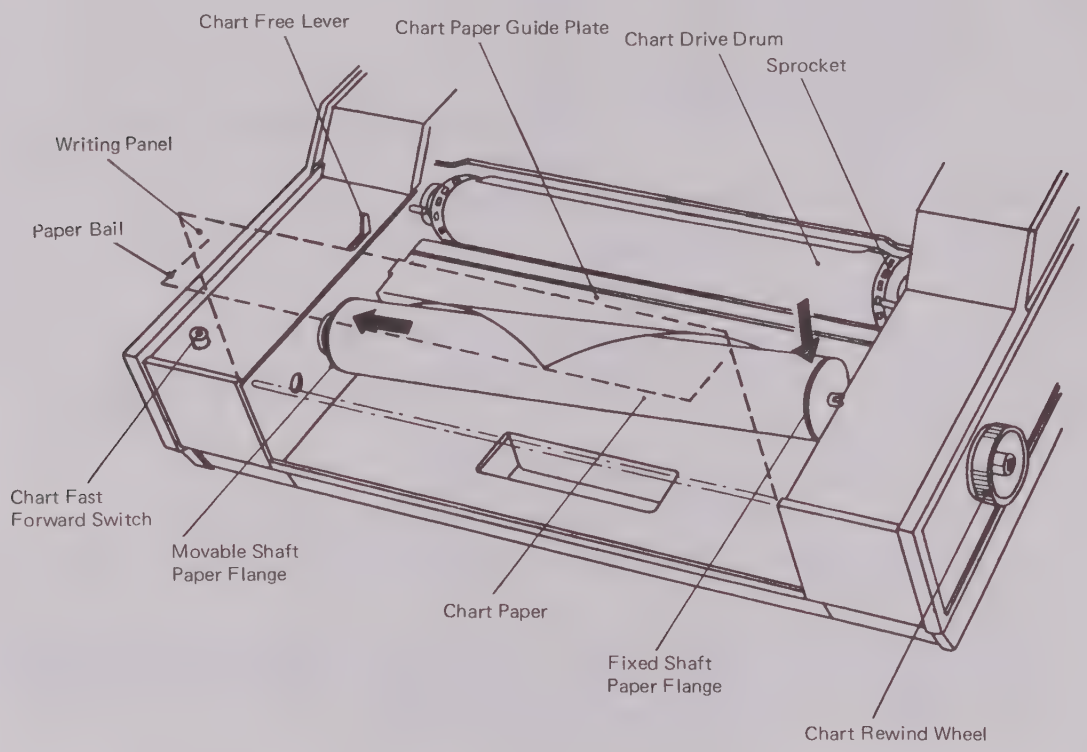


Fig. 5.1 Loading Roll Chart Paper

5.2.2 Loading Z-fold Chart Paper (SOLTEC ZN2-01-25-20M)

A. Set CHART FREE lever to FREE.

B. Open writing panel.

C. Before loading new chart paper, ruffle it for smooth operation as shown in Fig. 5.2 (b).

D. Place the paper pack in the storage tray with the long perforations to the left and the square holes to the right. Place the paper pack against positioning guide and front lip of storage tray.

E. Pass the end of the chart paper over the chart paper guide plate and under the chart drive drum.

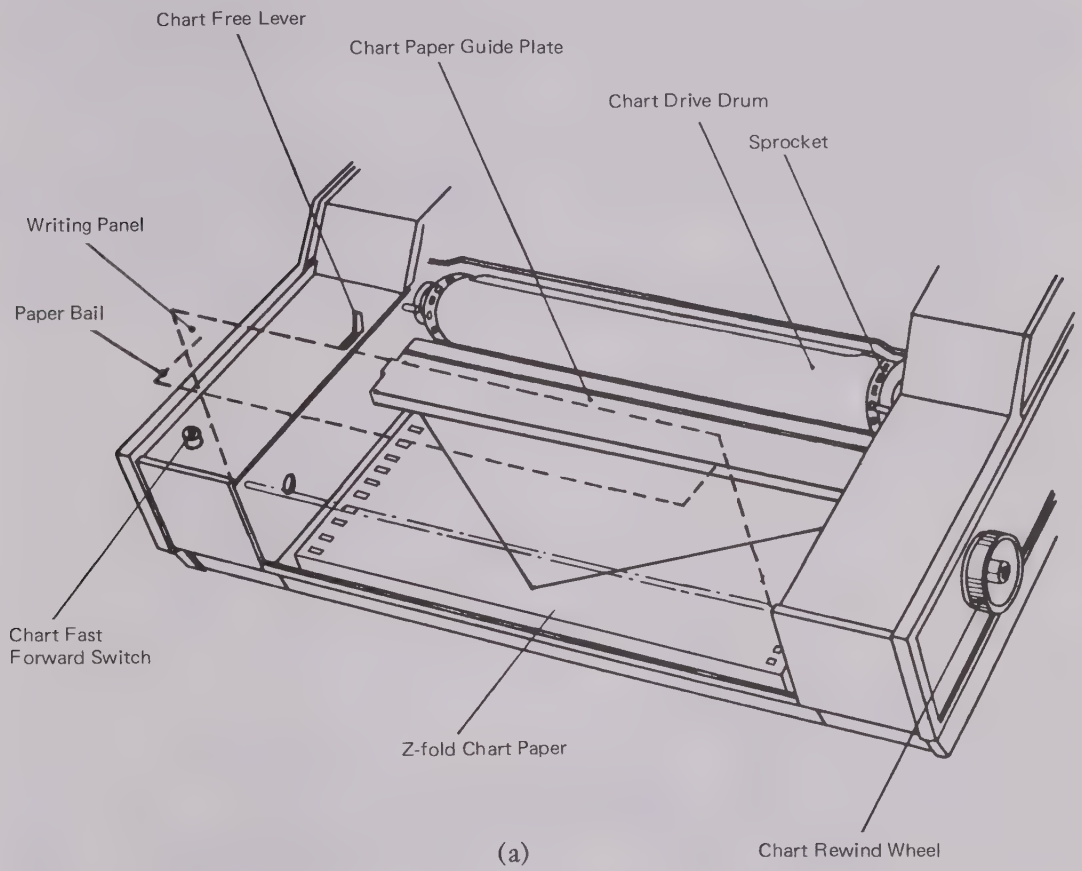
F. The paper should be now fed around drum and appears at the top of the chart drive drum. Pull the paper end until about 10cm of the paper emerges above the drum. Then close the writing panel.

G. Guide the chart paper from the top of the drum to pass between the writing panel and the paper bail.

H. Ensure that the sprockets of the chart drive drum and the paper perforations are engaged properly.

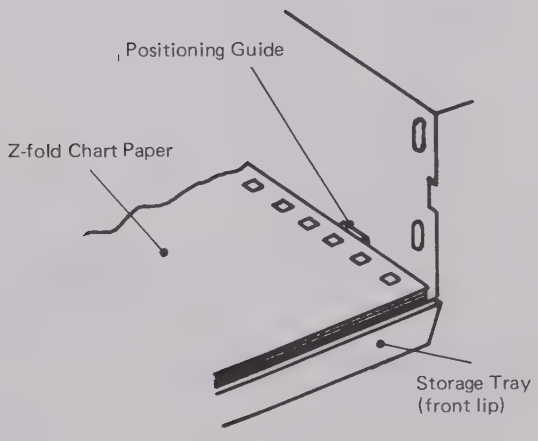
I. Set the CHART FREE lever to the position opposite the arrow.

J. Check the chart paper drive using the CHART FAST switch.
This completes the loading of Z-fold chart paper into the recorder.



(a)

(b)



(c)

Fig. 5.2 Loading Z-fold Chart Paper

5.2.3 Chart Take-up (Option)

A. Pull out chart paper from the drum and pass it under the paper bail.
Wind the chart end around the chart take-up core supplied with recorder for a couple of turns, with the printed side of chart paper facing out.

B. Insert the movable shaft paper flange in the left side of the chart take-up core and the fixed shaft paper flange in the right side.

C. Open the front writing panel (chart take-up cover) as shown in Fig. 5.3.

D. Install the movable shaft paper flange in the left take-up bearing.
Then while pushing chart core to the left, install the fixed shaft paper flange in the right take-up bearing.

E. Turn the chart take-up core to engage the slotted shaft of the fixed shaft paper flange with the driving shaft in the right take-up bearing.

F. Close the front writing panel.

G. Set the chart take-up ON/OFF switch to ON.

H. Check that the chart paper is properly taken up.

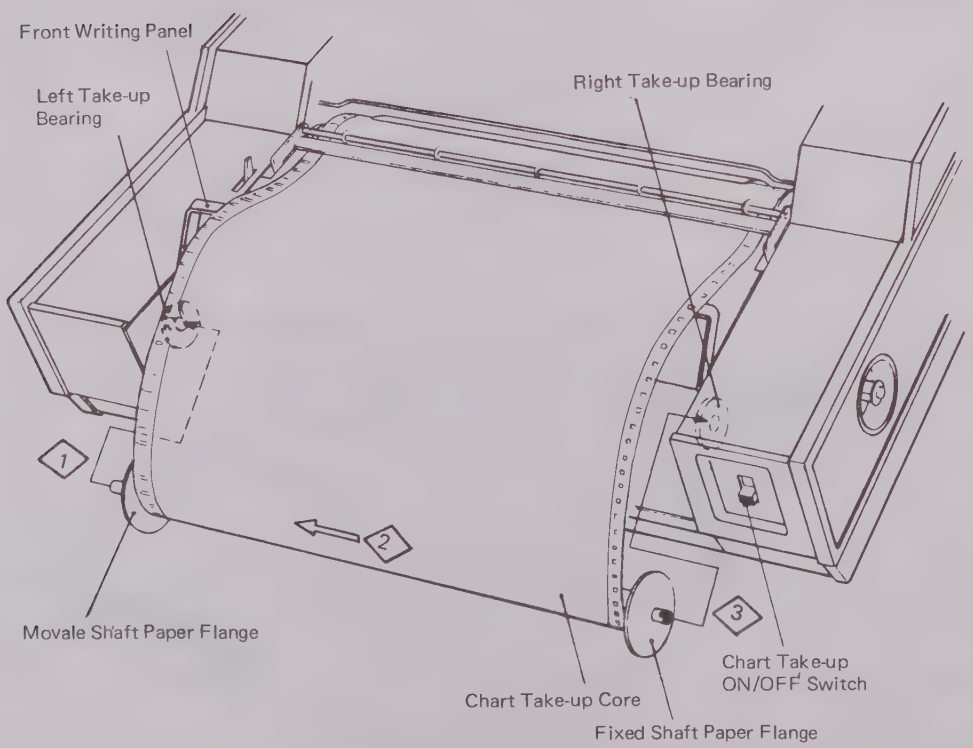


Fig. 5.3 Chart Take-up (Option)

5.3 INSTALLING PEN

5.3.1 Installing Pen for 1241–3

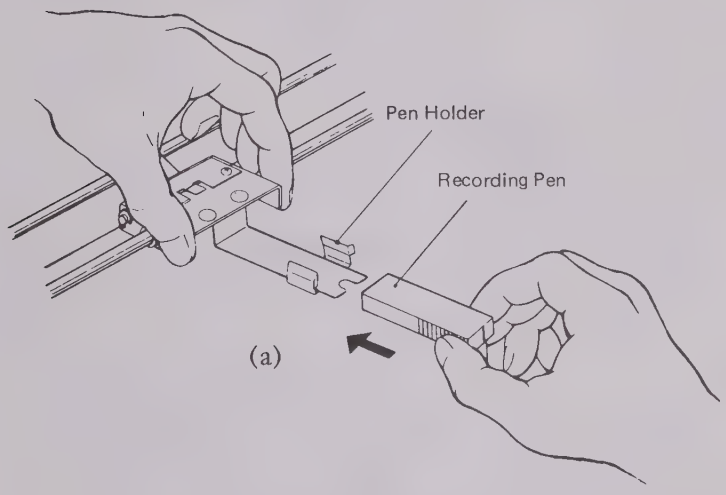
A. Open pen cover and move pen holders to center.

B. Refer to Fig. 5.4 for installation of Model 1241–2 pens. Ensure that pen nib is into recess of pen holder.

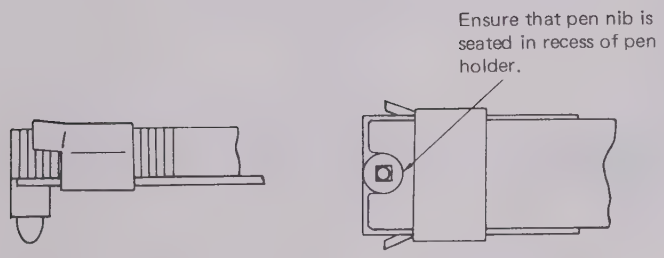
C. Refer to Figs. 5.5 and 5.6 for installation of Model 1243 pens.

This completes installation of recording pen. When removing the pen, reverse the procedure.

- Store pen cap in pen box during recording.
- Be sure to cover pen nib with cap when pen is not used.



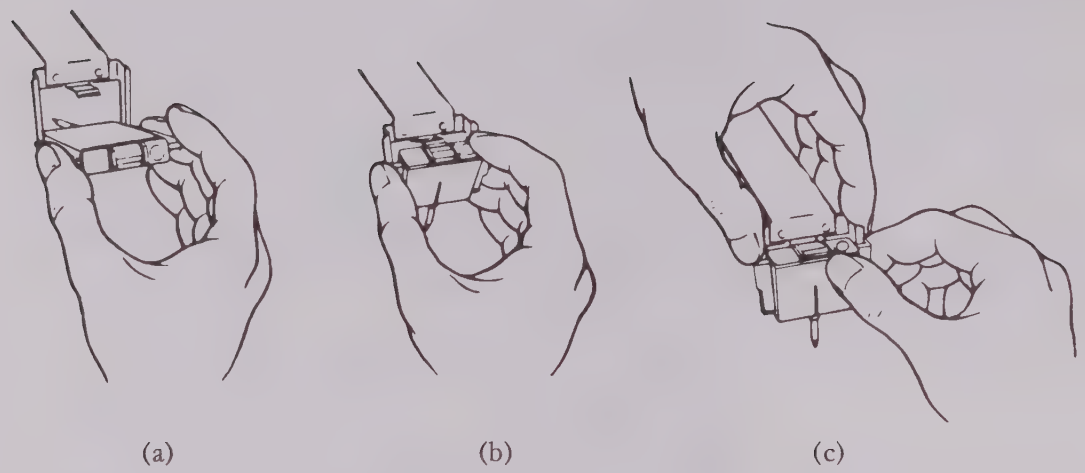
(a)



Side View Bottom View

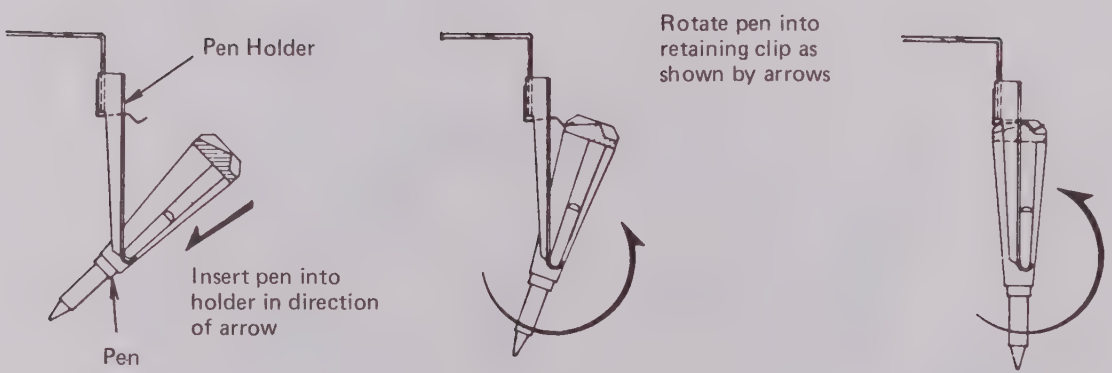
(b)

Fig. 5.4 Installing Pen, 1241–2



(a) (b) (c)

Fig. 5.5 Installing Pen, 1243



(a) (b) (c)

Fig. 5.6 Installing Pen, Side View, 1243

5.3.2 Installing Event Marker Pen for 1241–2 (Option)

A. Install Event Marker Pen referring to Fig. 5.7.

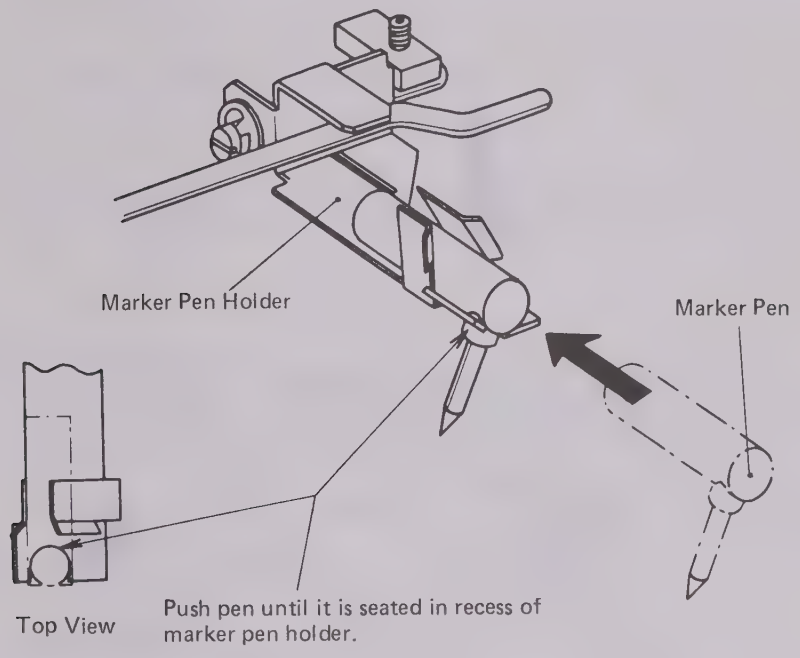


Fig. 5.7 Installing Event Marker Pen, 1241–2

NOTES:

1. Store pen cap in pen box during recording.
2. Be sure to cover marker pen nib with cap when pen is not being used.

5.3.3 Installing Event Marker Pen for 1243 (Option)

A. Hold the Marker Pen Holder and slide the Marker Pen into the holder.

B. Turn the Marker Pen and install it under the Pen Support Spring.

NOTE: Be sure to cover marker pen nib with cap when pen is not used.

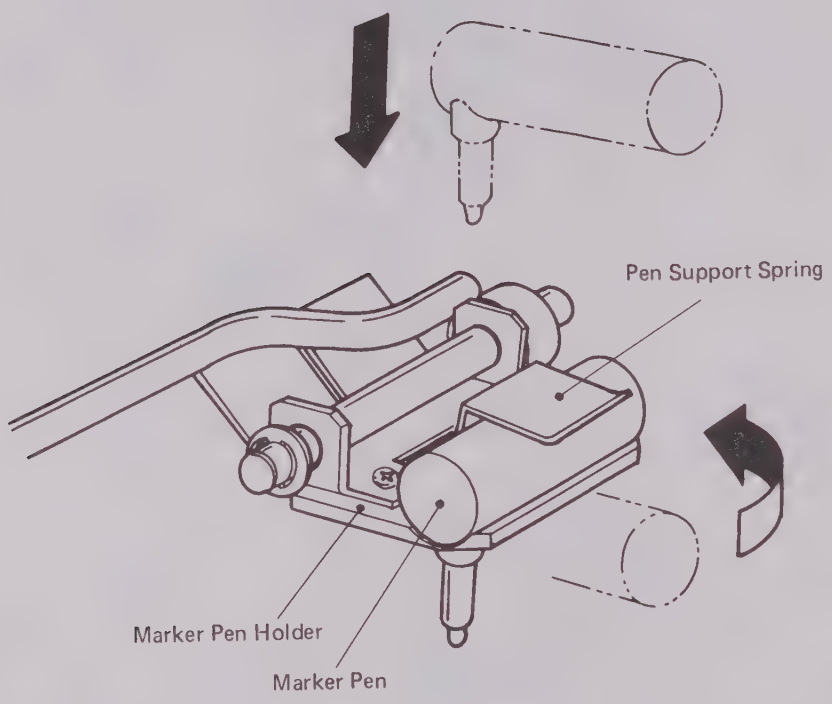


Fig. 5.8 Installing Event Marker Pen, 1243

5.4 OPERATIONAL PRECAUTIONS

5.4.1 Pen

Leaving the pen nib uncapped when not in use will cause premature failure. Cap pen nibs when not recording to ensure maximum pen life.

5.4.2 Ground

Ground the recorder for safety and stable operation.

5.4.3 Environment

Operate the recorder in an environment where the temperature is between 0 and 45°C and humidity (ideal) is between 45 and 85%. Choose a location where vibration and dust are minimal.

5.4.4 Chart Drive

Because a pulsed stepper motor is used for driving the chart, a steplike action may be observed when the chart paper is driven at a low speed. Step increments are, however, very small and will cause no distortion on the trace.

5.4.5 Power

Recorder operates on 115V AC 50/60Hz.

5.4.6 Maximum Input Voltage

Although a protection circuit using zener diodes is provided in the input circuit of this recorder, the circuit may be damaged by any input exceeding voltage shown in Table 5.1.

	Measuring Range	Range of Input Voltage Tolerated
Versions with Multiple Ranges	1mV~50mV	30V max.
	100mV~200V	200V max.
Versions with Single Range	1mV~50mV	30V max.
	100mV~200V	200V max.

Table 5.1 Maximum Input Voltage

5.4.7 Common Mode Voltage

Nominal dielectric strength between the INPUT terminals and chassis (GND) is 1000V AC for 1 min. The common mode voltage which can be applied continuously is 500V AC (50/60Hz) and 500V DC. Considering the common mode rejection ratio (CMRR) of this recorder, the voltage which can be applied where the effect on the recording accuracy is less than 0.1% is up to 30V AC rms (50/60Hz) and 100V DC at the maximum sensitivity of 1mV/full span.

5.4.8 Connection of Input Signal

Connect input using shielded wires as shown in Fig. 5.9. Where the signal lines become long and noise presents a problem, use double shielded wires and ground ends of outer shields as shown in Fig. 5.10.
The lowest impedance path for AC signals to chassis ground is to the "–" terminal, while the "+" terminal presents the highest impedance.

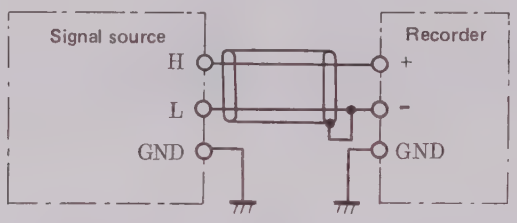


Fig. 5.9 Connection of Signal (Typical)

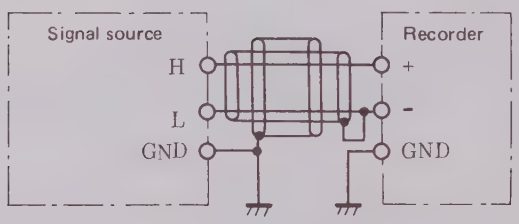


Fig. 5.10 Connection of Signal (when noise presents a problem)

5.4.9 Thermocouple Selection (For Thermocouple/Temperature Input Modules)

When measuring temperature, use a thermocouple suited to the input module which is in the recorder. It is necessary to select the thermocouple depending on the temperature to be measured since the temperature range differs according to the thermocouple used.

5.4.10 Connecting Thermocouple

Connect thermocouple lead wire directly or by using lead wire as shown in Fig. 5.11. Use only the thermocouple type compatible with the module.

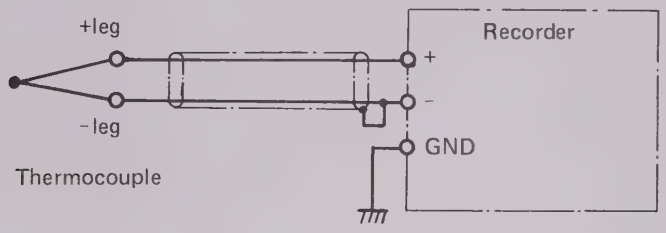


Fig. 5.11 Connecting Thermocouple

5.4.11 Signal Source Resistance

If the internal resistance of the signal source is too large, errors will be induced in the recording; also, response of the pen may be overdamped due to the influence of the filter circuit of the recorder. Therefore, use a signal source resistance within specification to reduce the possibility of inaccuracy.

Overdamping due to high signal source resistance will affect only the low range selections – 1mV to 50mV. Correction of this error due to high signal source resistance can be calculated as follows:

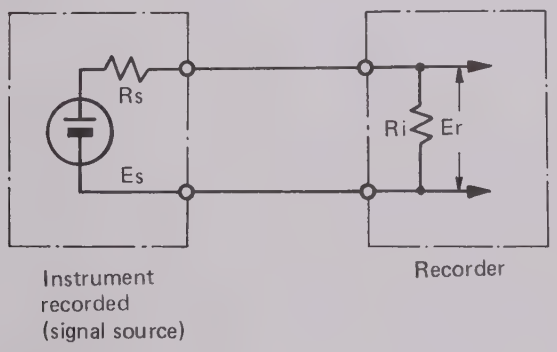


Fig. 5.12 Influence of Signal Source Resistance

$$Er = \frac{Ri}{Rs + Ri} \times Es$$

Where, Es: signal voltage
Rs: signal source internal resistance
Ri: recorder input resistance
Er: voltage recorded

SECTION 6

MAINTENANCE

6.1 INSTALLING PEN DRIVE WIRE, 1241–3

When changing the drive wire, install it according to the following procedure: (Refer to Figs. 6.1, 6.2, 6.3, 6.4, 6.5 and 6.6)

A. Remove top plate. On Models 1241–2, pull left and right top sleeve plate upward while pushing claw with a small screw driver (Fig. 6.1). See Figs. 6.4 and 6.5 for Model 1243.

B. Insert pulley positioning rod (supplied with recorder) into threaded hole in front of channel 1 pulley. Hold rod erect while rotating pulley until rod drops into lower recess. Tighten the pulley positioning rod (refer to Fig. 6.2).

C. Pass one end of wire from above pulley wire start hole; make a knot on other end of the drive wire and pull the wire out.

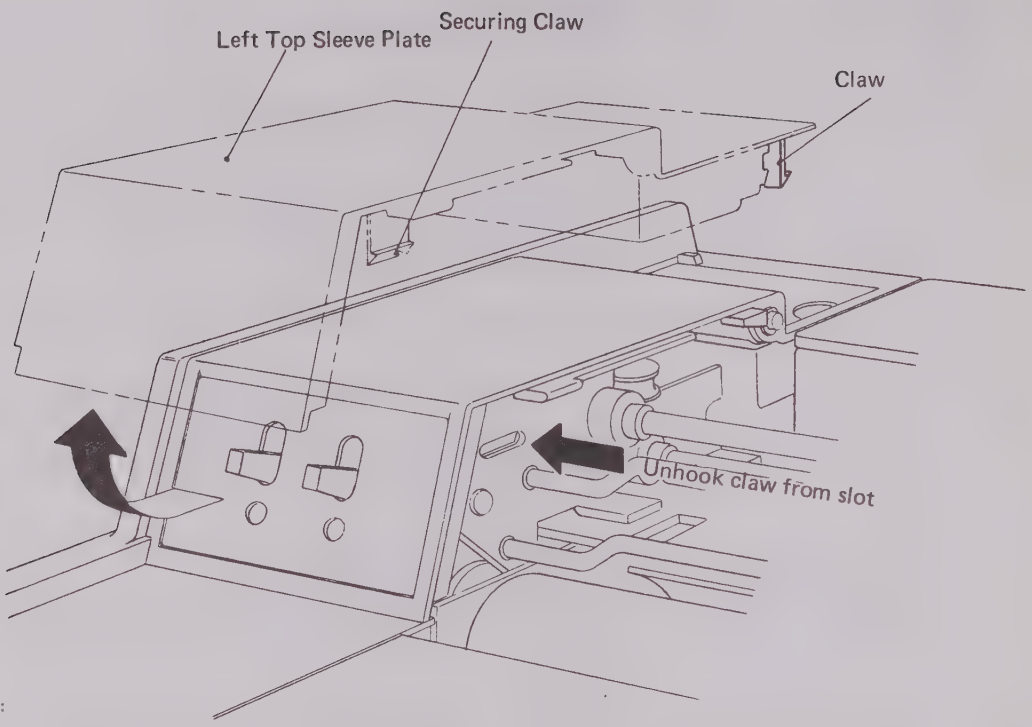
D. Pass wire into pulley groove from rear side of pulley through split groove. Wind the wire approximately twice clockwise. Return wire to original pulley through one bearing pulley. Wind wire twice approximately clockwise and bring it to surface of pulley through split groove. Fix wire to screw at anchor point.

E. Set the recorder pen at the 50% position on the chart paper. Place the wire between wire securing plate and pen carriage and secure with stop screw. Position the wire as close to the middle of the gap between the pulley positioning rod and hole as possible.

F. Remove the pulley positioning rod.

G. Reinstall the left and right top sleeve plates and top plate which were removed earlier.

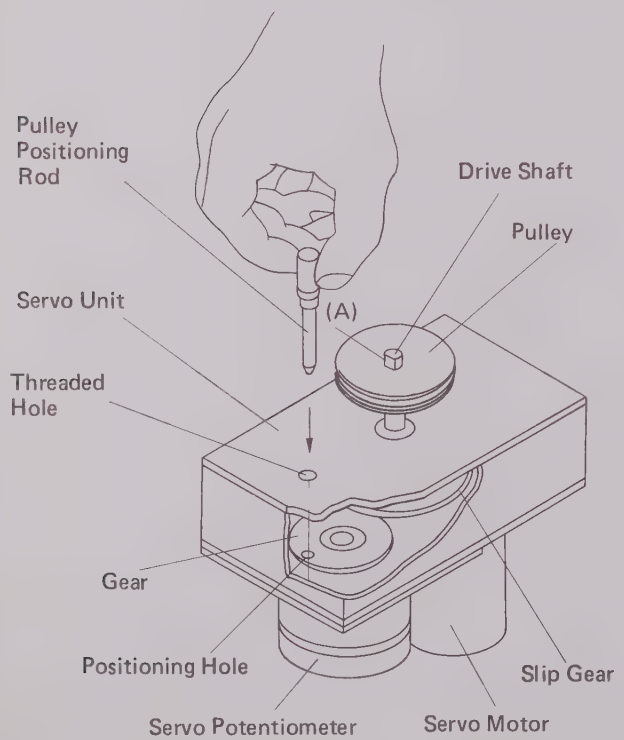
This completes the drive wire installation.



NOTE:

(1) Right top sleeve plate claw is positioned the same as the left side. Unhook the claw in same manner.
(2) When installing top sleeve plate, ensure that the claw is firmly hooked into groove.

Fig. 6.1 Removing Top Sleeve Plate, 1241—2

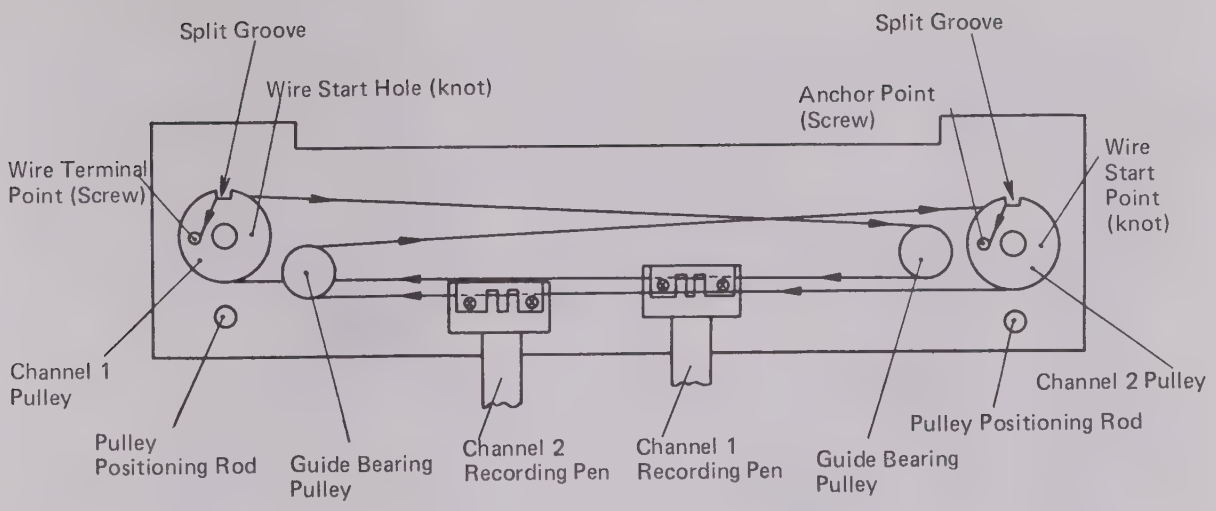


NOTE:

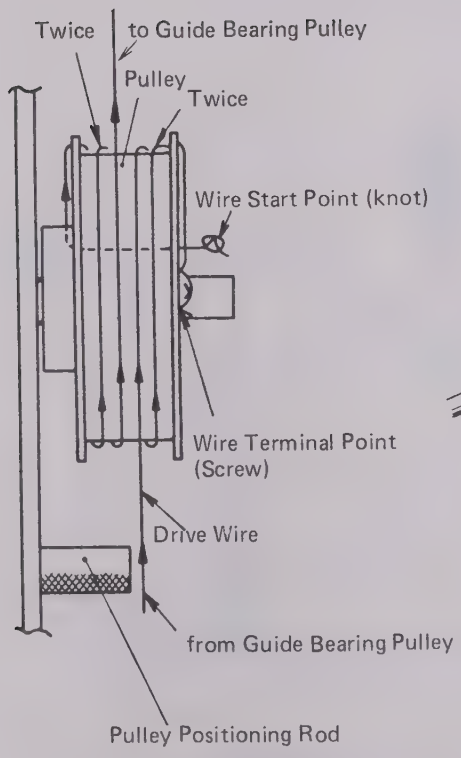
How to use pulley positioning rod.

(1) Position the drive shaft so that its chamfered portion (A) will face to the threaded hole. This align the threaded hole and positioning hole.
(2) Insert the pulley positioning rod into the threaded hole and tighten it. The pulley will be locked.

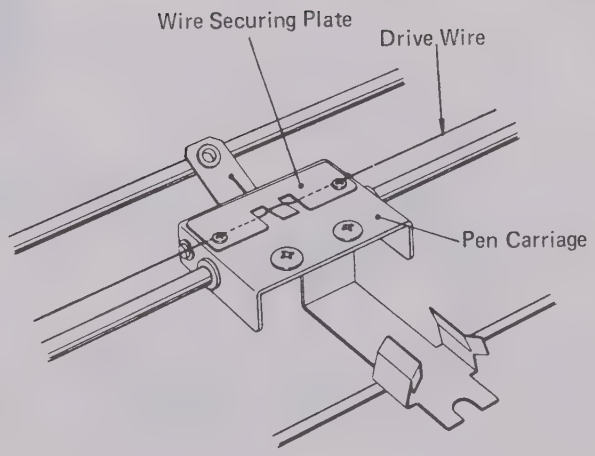
Fig. 6.2 Installing Pulley Positioning Rod



(a) Drive Wire Routing

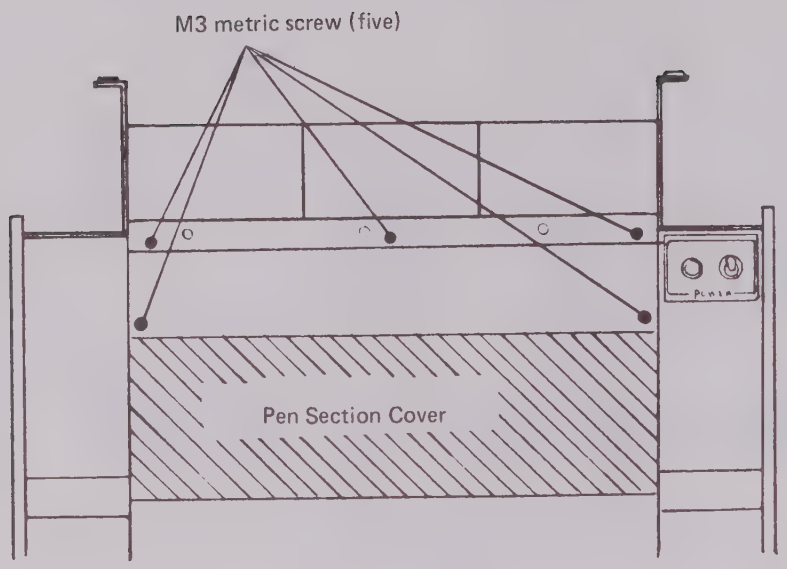


(b) Enlarged View of Channel 1 Pulley



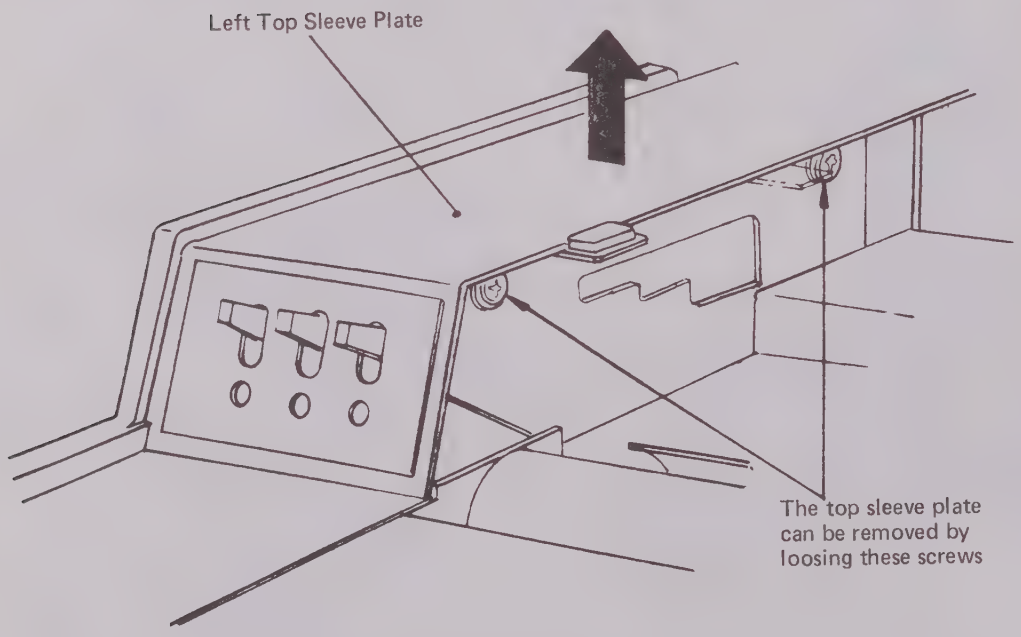
(c) Securing Wire of Pen Carriage

Fig. 6.3 Installing Drive Wire, 1241—2



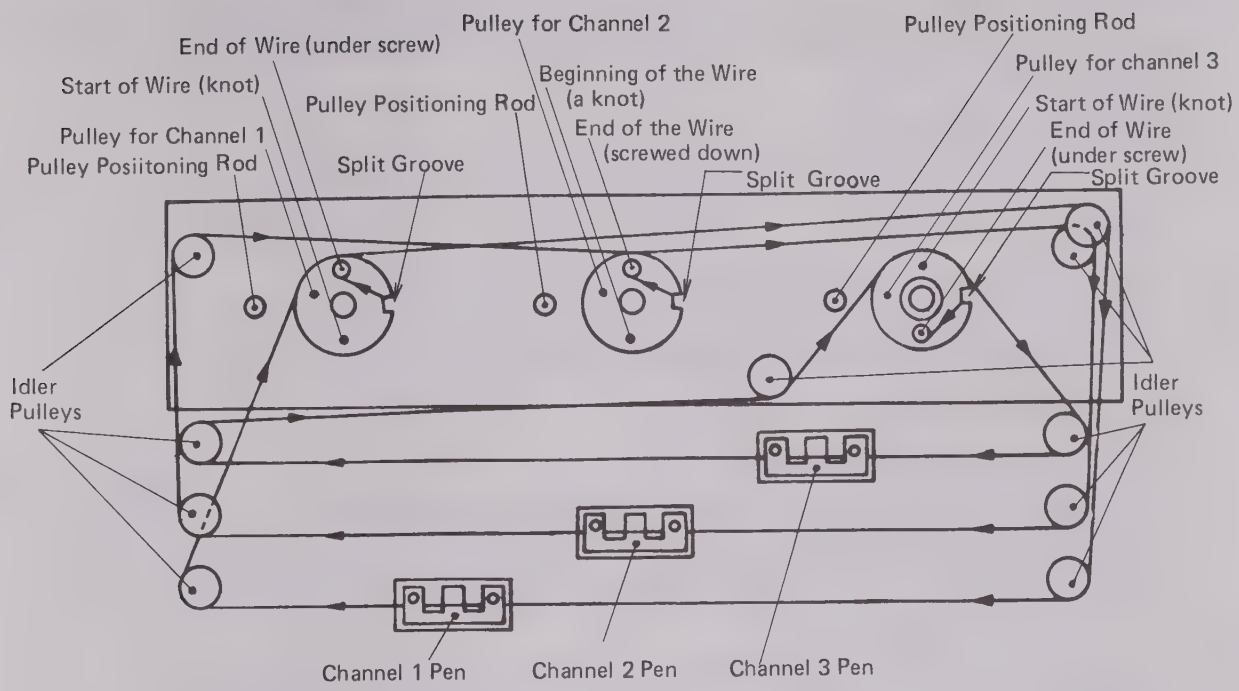
Unscrew five indicated screws to allow cover removal.

Fig. 6.4 Removing Pen Section Cover

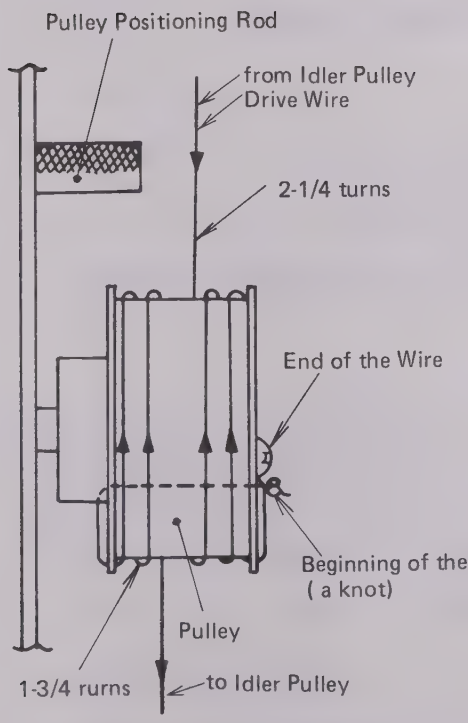


The screws for the right top sleeve located in corresponding positions on right side.

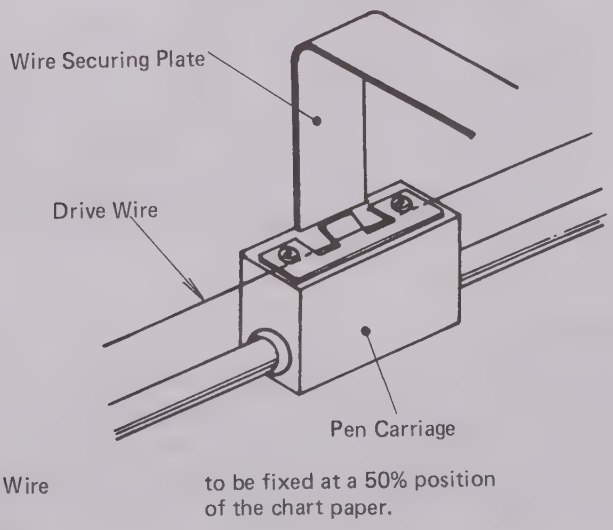
Fig. 6.5 Removing Top Sleeve Plate, 1243



(a) Drive Wire Routing



(b) Enlarged View of Channel 1 Pulley



(c) Securing Wire of Pen Carriage

Fig. 6.6 Installing Drive Wire, 1243

6.2 CALIBRATION

The full span voltage is adjusted by the manufacturer before shipment from the factory and will normally not require readjustment. Readjustment will be necessary, however, when any of the following parts are replaced:

(1) Potentiometer or servo
(2) Amplifier or any part of the reference power circuit in the amplifier

> NOTE:
> Chart paper expands and contracts with temperature and humidity.
> Therefore chart grid width should be checked against a steel scale prior to calibrations, and calibrations should be take any differences into account.

Allow 30 minute warmup prior to calibration.

Procedure using internal calibration source:

A. On multi-range module, set RANGE to maximum sensitivity position.

B. Set MEAS./CHK/CAL. to CHK.
Set pen to exactly zero on chart using POSITION control.

C. Set MEAS./CHK/CAL. to CAL.
Adjust pen to 100% on chart using CAL. control on rear panel of module.
VERNIER control, if present, must be full CW.

Procedure using external calibration source:

A. If multi-range module, set RANGE to maximum sensitivity position.

B. Set MEAS./CHK/CAL. to CHK.
Connect external source to input terminals.

C. Set external source 0.00 ± .05mV.
Adjust pen to exactly zero on chart using POSITION control.

D. Set external source to a value equivalent to full span ±0.5%.
Adjust pen to exactly 100% on chart using CAL. control on rear panel of module.
VERNIER control, if present, must be full CW.

6.3 DAMPING

The best response to the input signal is obtained when damping is adjusted as shown in Fig. 6.7. Readjustment of damping is normally not required. To check for proper damping, inject a square wave input signal of 90% of full amplitude except in RTD module; in RTD module, alternate MEAS./CHK/CAL. switch between CHK and CAL. to simulate square wave. Adjust DAMP control for best response as shown in Fig. 6.7.

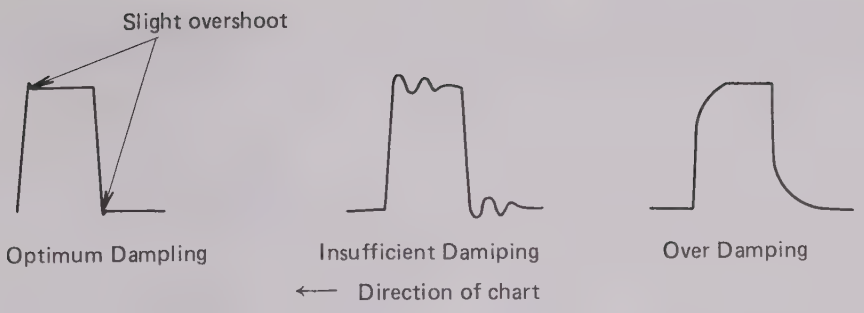


Fig. 6.7 Damping Responses when Recording Square Wave Input Signal

6.4 MARKER

This adjustment is for altering amplitude of the marker which is superimposed on the trace. This is adjustable within +7% of full scale. The marker amplitude is adjusted to +3.5 ±1% of full scale at the factory and seldom requires readjustment.

6.5 LUBRICATION

Periodic oiling is essential to keep the recorder in good operating condition.
Oil the recorder once every 2 to 3 months. Be sure to wipe away any dust or foreign matter prior to oiling.

The oiling points are as follows:

A. The rails of the recording pen.

B. The bearings of the chart paper bail.

C. The rotary shaft of the chart drive mechanism.

D. Generally, over other moving parts at bearing points.
Under no circumstances oil any electric part.

6.6 INPUT MODULE REPLACEMENT

6.6.1 Removing Input Module, 1241–2

A. Raise pen cover.

B. Remove (completely) the securing screw for input module. (Refer to Fig. 6.8)

C. Carefully remove module by pulling in rearward direction.

6.6.2 Removing Input Module, 1243

A. Remove four screws and the pen section cover assembly. (Refer to Figs. 6.9 and 6.10)

B. Remove (completely) the securing screw for input module.

C. Carefully remove module by pulling in rearward direction while wiggling module.

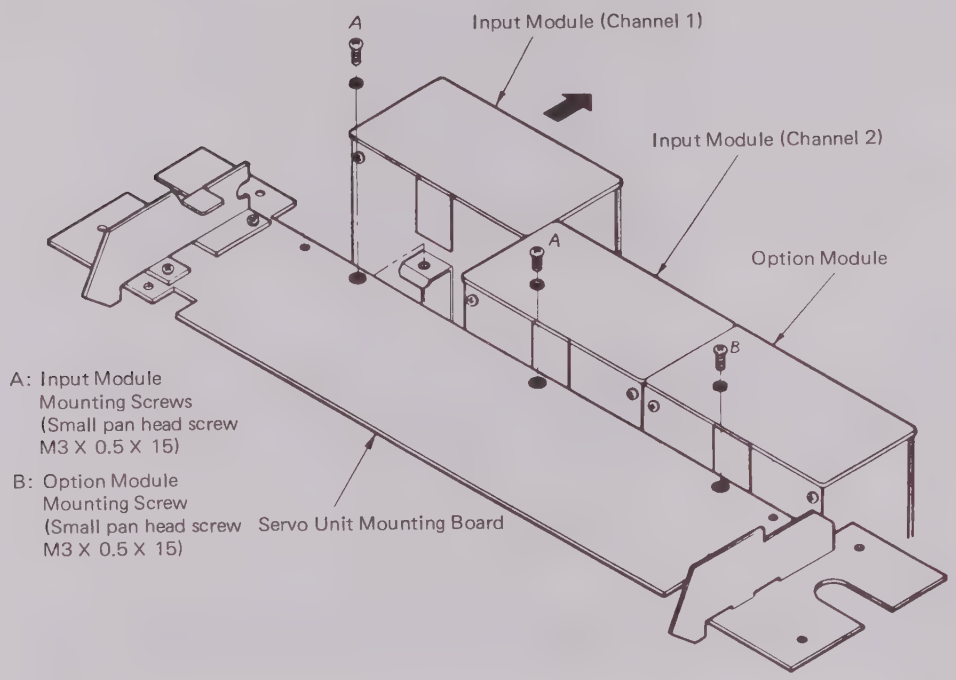
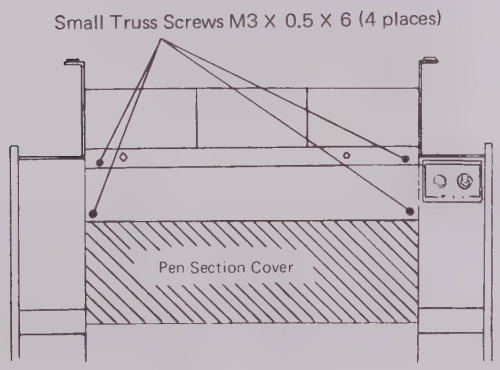


Fig. 6.8 Removing Input Module, 1241–2



Loosen the above four screws to remove the pen section cover.

Fig. 6.9 Removing Pen Section Cover 1243

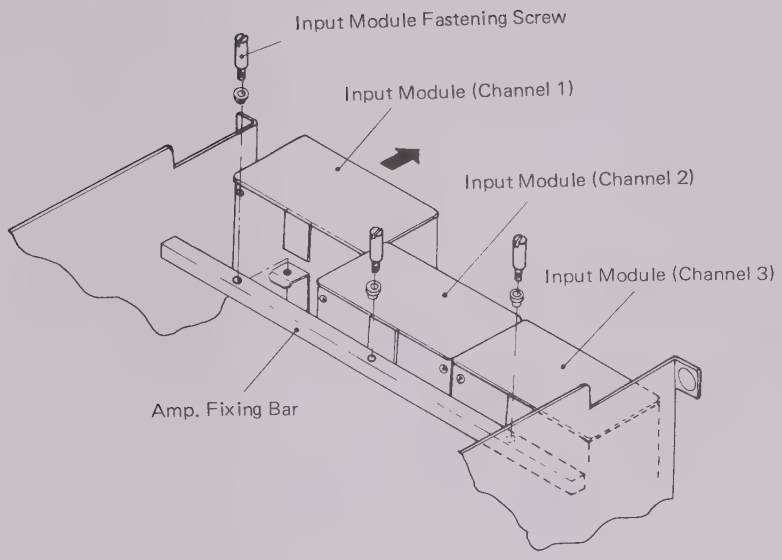


Fig. 6.10 Removing Input Module, 1243

SECTION 7

CIRCUIT DESCRIPTIONS

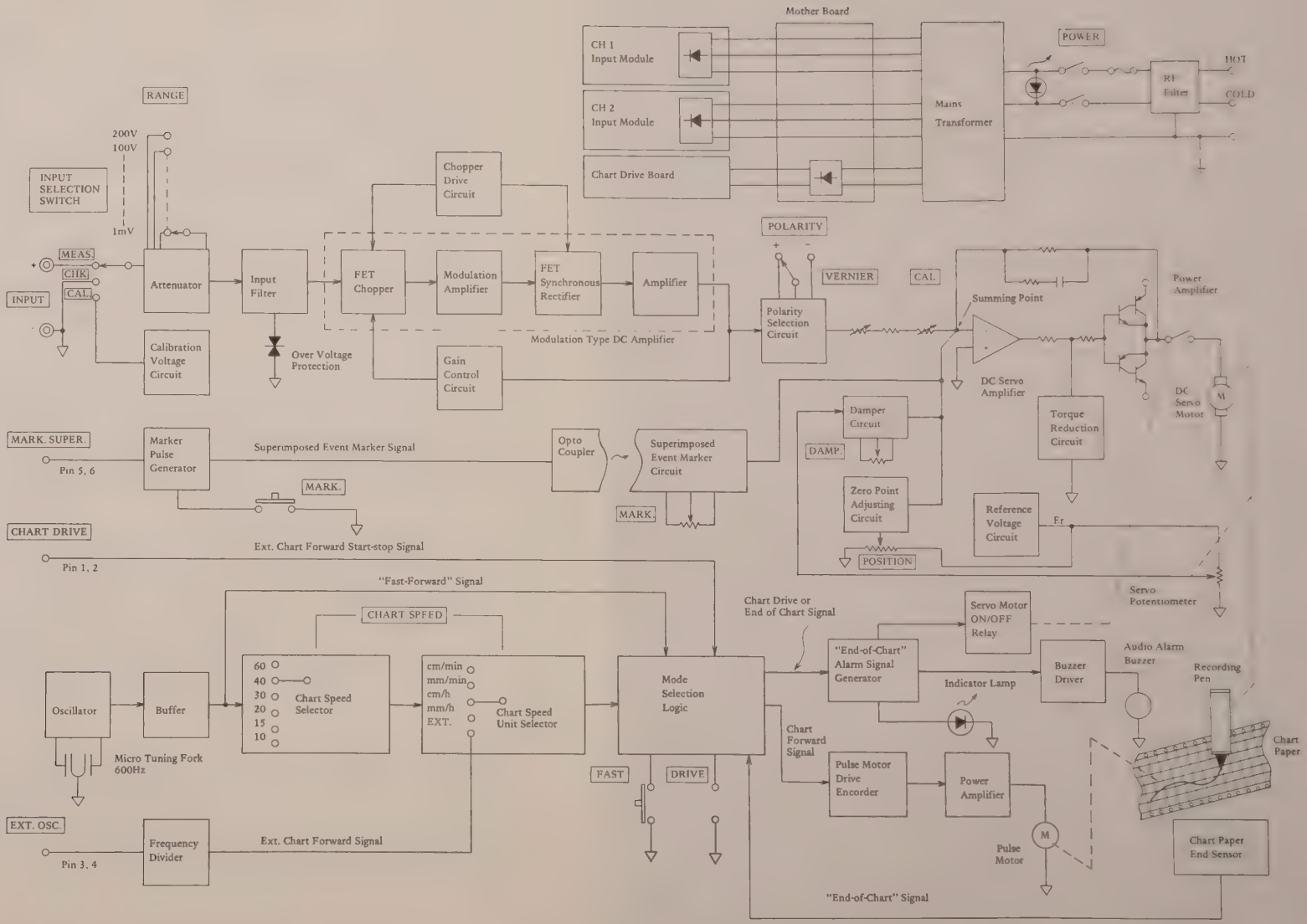


Fig. 7.1 Functional Block Diagram, 1241–3

7.1 INPUT CIRCUIT AND MODULATION-TYPE DC AMPLIFIER

7.1.1 Input Selection Switch

A. "MEAS." position
The signal connected to the input terminal is transmitted to the amplifier.

B. "CHK" position
The input signal is disconnected, and the zero position of the recording pen can be set. The zero control is in series between the reference power supply (Er) and the ground, and the slider is connected to the input of the DC servo amplifier.

C. "CAL." position
The output of calibration power supply is transmitted to the input attenuator. This output is equivalent to the maximum sensitivity range (1mV) of the multirange input module and is used for full scale calibration.

D. If the attenuator is set to the 1mV range, the zero position of the pen to the right reference point of the chart paper, and if the input selection switch is set to the "CAL." position, the pen will move from the right reference point to the 100% position on the left end.

7.1.2 Overvoltage Input Protection

If an overvoltage is applied to the input terminal, the FET chopper can be damaged. To prevent this possibility, a zener diode is connected in parallel to the filter circuit.
If a signal higher than the maximum allowable input voltage for the respective range is applied, it can result in damage to the zener diode and other circuits as well. There is no warranty against such damage.

7.1.3 Attenuator ("RANGE SWITCH")

In the multirange input module, 17 input ranges (1mV ~ 200V) can be selected by means of the "RANGE" rotary switch.
The dividing of the input voltage is performed by a combination of resistors and the gain control of the modulation-type DC amplifier.
The fixed 17-step ranges have been calibrated at the factory.
If the fixed input range needs to be altered to adjust to the measuring signal, this can be accomplished by using the range vernier adjuster provided.

7.1.4 Circuit Description

A. The input signal connected to the input terminals "+" and "–" will be transmitted to the DC amplifier through the input selection switch in the "MEAS." position, after going through the attenuator and the filter circuit.

B. The FET chopper type DC amplifier is constantly switching output from the chopper drive circuit which converts the incoming DC voltage input signal into a 1kHz AC signal.

C. This AC signal is amplified by a high gain AC coupled amplifier and transmitted to the FET synchronous rectifier circuit where the signal is demodulated back into a DC voltage input signal. Then it is subjected to DC amplification.

D. The FET chopper and the integrator combined is called the modulation type DC amplifier. To stabilize this system, the integrator output is fed back to the FET chopper through the gain control circuit. At the same time, this output is transmitted to the input (summing point) of the DC servo amplifier after the polarity selection circuit, the range vernier "VERNIER" and the full span voltage calibrator.

7.2 SERVO SYSTEM

7.2.1 Range Vernier ("VERNIER") and Full Span Voltage Calibrator ("CAL.")

In order to adapt the amplitude of the input signals to the full scale of the chart, a range vernier and a "CAL." calibrator for varying the fixed input range are provided between the output of the modulation type DC amplifier and the summing point of the DC servo amplifier through the polarity section circuit.

7.2.2 Damping Control ("DAMP.")

For accurate recording, a damping control is provided between the slider of the servo potentiometer and the summing point of the DC servo amplifier.
By using this control, the step function input can be adjusted for critical damping.

7.2.3 Polarity Switch ("POLARITY, +, -")

The integral amplifier output of the modulation type DC amplifier is connected to the summing point of the DC servo amplifier through the polarity switch, the range vernier and the full span voltage calibrator.
With the polarity switch set in the "+" position, the pen is set at the factory so that the pen travels right to left when the input signal changes from zero to the positive potential. When the switch is in the "-" position, the pen moves from left to right as the input signal increases.

7.2.4 Servo Motor Overload Protection Circuit

If an input voltage higher than the maximum input voltage for the attenuator is applied for a prolonged time, it could result in damage to the servo motor.
To eliminate this possibility, a torque reduction circuit is provided between the DC servo amplifier and the power amplifier.
If an input voltage exceeding the full scale is applied for one second, this circuit will automatically detect it and reduce the input voltage of the power amplifier below the maximum allowable level to protect the servo motor.

7.2.5 Superimposed Event Marker Switch ("MARK.")

The "MARK." switch output of the marker pulse generator is fed to the summing point of the servo amplifier through the opto coupler. Each time the "MARK." switch is pressed, a pulse will be output from the monostable pulse generator and transmitted to the summing point. When the input of the DC servo amplifier is not at the saturation state, the "MARK." pulse is superimposed to the input signal, and this is reproduced on the chart paper by the recording pen.
If a TTL "low" signal is applied to the external control connector pins 5 and 6 "MARK. SUPER" on the remote control panel, the marker pulse will be actuated.

7.2.6 Reference Power Supply ("Er")

The reference power supply that is used as a comparison for the changing input signal is one of the most important circuits in the recorder.
In this unit, the reference power supply is a stabilized voltage output, which is also more stabilized within ±50ppm with a temperature compensating zener diode.

7.2.7 Circuit Description

A. The input signal transmitted from the modulation type DC amplifier to the summing point is compared with the reference power supply from the servo potentiometer through the damping circuit.

B. If there is a difference between the two voltages, that difference will be amplified by the DC servo amplifier and sent through the power amplifier to drive the DC servo motor.

C. The shaft of the servo motor is connected to the slider of the servo potentiometer and the recording pen through the drive wire. Therefore, the movement of the servo motor shaft is transferred to the slider of the servo potentiometer and the recording pen.

D. If the voltage output of the servo potentiometer is larger than the DC voltage input signal, the servo motor circuit will work to lower the voltage output by driving the slider of the servo potentiometer until the difference is reduced to zero.

E. When the DC voltage input signal is equal to the voltage output of the servo potentiometer, the input signal to the DC servo amplifier is zero and the servo motor drive circuit output is zero.

F. This operation is continuous from the time when the DC voltage input signal level begins to change till the change stops. The changes are recorded on the chart paper by the recording pen.

7.3 CHART DRIVE

7.3.1 Chart Drive Switch ("DRIVE")

A. To feed the chart paper, set the "DRIVE" switch at ON position. When the switch is turned on, the indicator lamp provided on the left side of the "DRIVE" switch lights up. When the chart paper is driven at a low speed, the indicator lamp may flicker. That is due to the pulsed drive of the stepper motor and does not indicate trouble.

B. If a "0" signal (TTL level) is given to the external control connector pins 1 and 2 "CHART DRIVE" on the remote control panel, the chart drive function is actuated. To use this, set the chart drive switch at OFF position.

7.3.2 Chart Drive Fast Forward Switch ("FAST")

Regardless of where the chart speed selector switches are set, the chart paper can be fed out at the speed of 60cm/min. by depressing the "FAST" switch.
The buffered output pulses of the oscillator circuit are transmitted to the mode selection Logic then pulse motor directly from the "FAST" switch.

7.3.3 Chart Speed Selector ("SPEED")

A. The chart speed selector section is made up of a pulse driver circuit and two switches — a speed selector and a units selector. The speed selector allows six different chart speeds and the unit selector four different units. A combination of these two switches makes 24 steps, or 23 speeds available.

B. When the chart paper is driven by an external signal, set the unit selector at "EXT." position. Connect the signal to the external control connector pins, 3 and 4 "EXT. OSC." terminals on the remote control panel.
In this case, the relationship between the number of pulses and the chart advance is 60 pulses/1mm.

7.3.4 Chart Drive Indicator Lamp ("DRIVE")

This indicator lamp has two functions. One is to indicate the chart drive condition as mentioned under "Chart drive switch". The other is to blink when the chart paper is out.
The indicator lamp is actuated by the alarm generator circuit.

7.3.5 Chart End Sensor Mechanism

This mechanism detects the end of the chart paper. Using the chart paper as an insulator, the sensor completes a circuit and generates the signal when the chart paper runs out.

7.3.6 Audio Alarm Buzzer

The end of the chart paper is also indicated by a flashing chart drive indicating lamp and an alarm buzzer.

7.3.7 Servo Motor ON/OFF Relay

To prevent the wearing out of the pen tip, and staining the sprocket, this relay is actuated to cut off the servo motor from the drive circuit when the chart paper has run out.

7.3.8 Circuit Description

A. The pulses for the chart drive circuitry are controlled by a 600Hz tuning fork oscillator and transmitted to the chart speed selector circuit through a buffer.

B. In the chart speed selector section, the pulse train is divided to a frequency proportional to the chart speed set by the operator.

C. The pulse train is input to the pulse motor drive conversion circuit and converted into a signal that drives the pulse motor.

SECTION 8

MECHANICAL PARTS

8.1 ORDERING INFORMATION

To order mechanical parts:

A. Find the part number of the required part by referring to the drawings.

B. Add the number after the two letters given in parentheses which are in the title of the drawing.

C. For example, if the replacement part you need is in the drawing titled AM (Top View, Mainframe, Models 1241 – 2) and its part number is 34, then the reference number is AM-34.

D. With this reference number, look up the part number and name of the part in the parts list.

E. In the above example, the Table 8.1 AM Part List at its Ref. No. AM-34 column shows:

Parts Number : 225D02-1821
Name : Pen holder

F. With AM-34 and the reference No., you can order the part from Soltec Corporation.

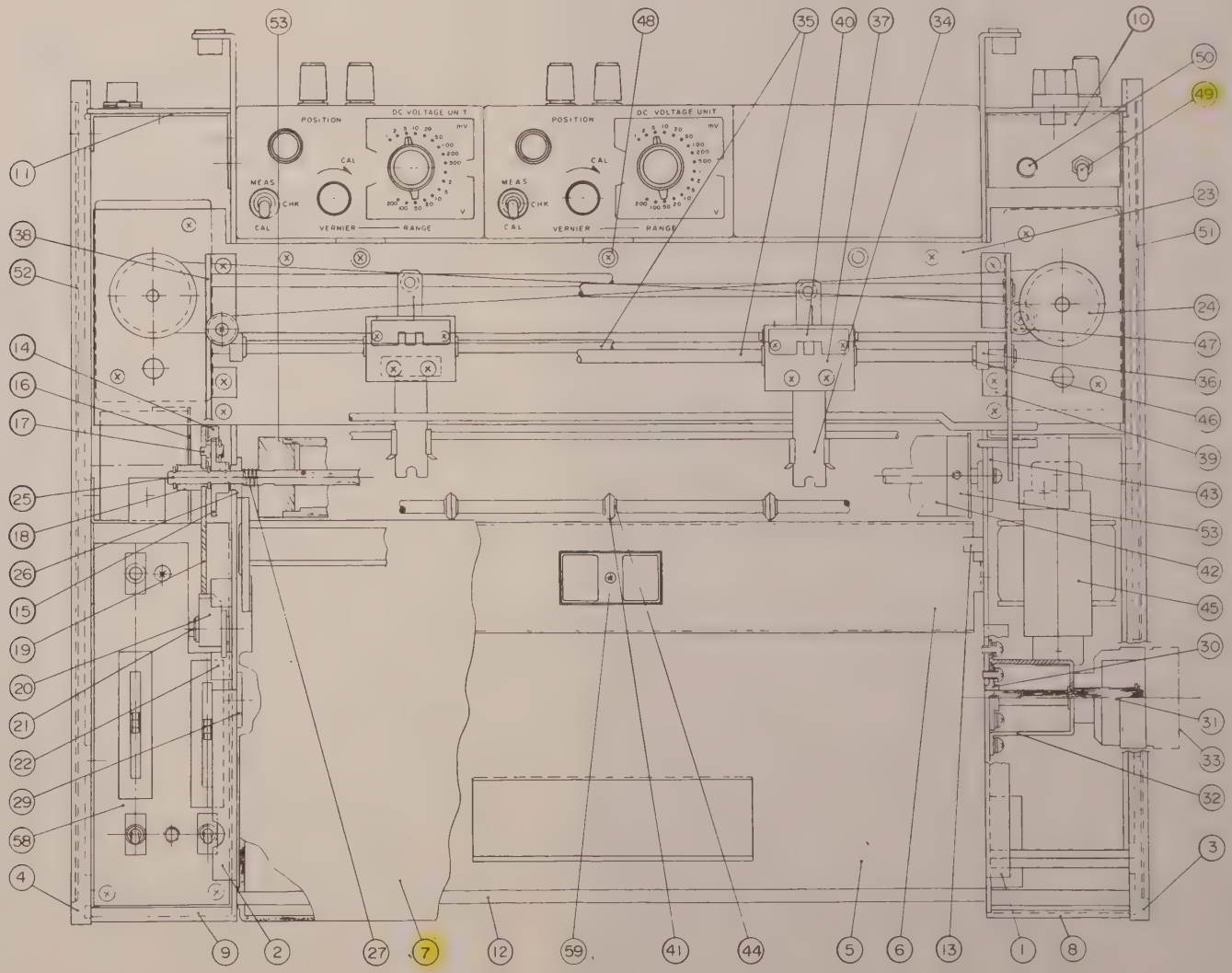
G. Your orders or inquiries should be addressed to

Customer Service Department
Soltec Corporation
11684 Pendleton Street
Sun Valley, California 91352
Phone: (213) 767-0044

H. Contact SOLTEC for additional parts requirements and information.

8.2 MECHANICAL DRAWINGS AND PARTS LIST

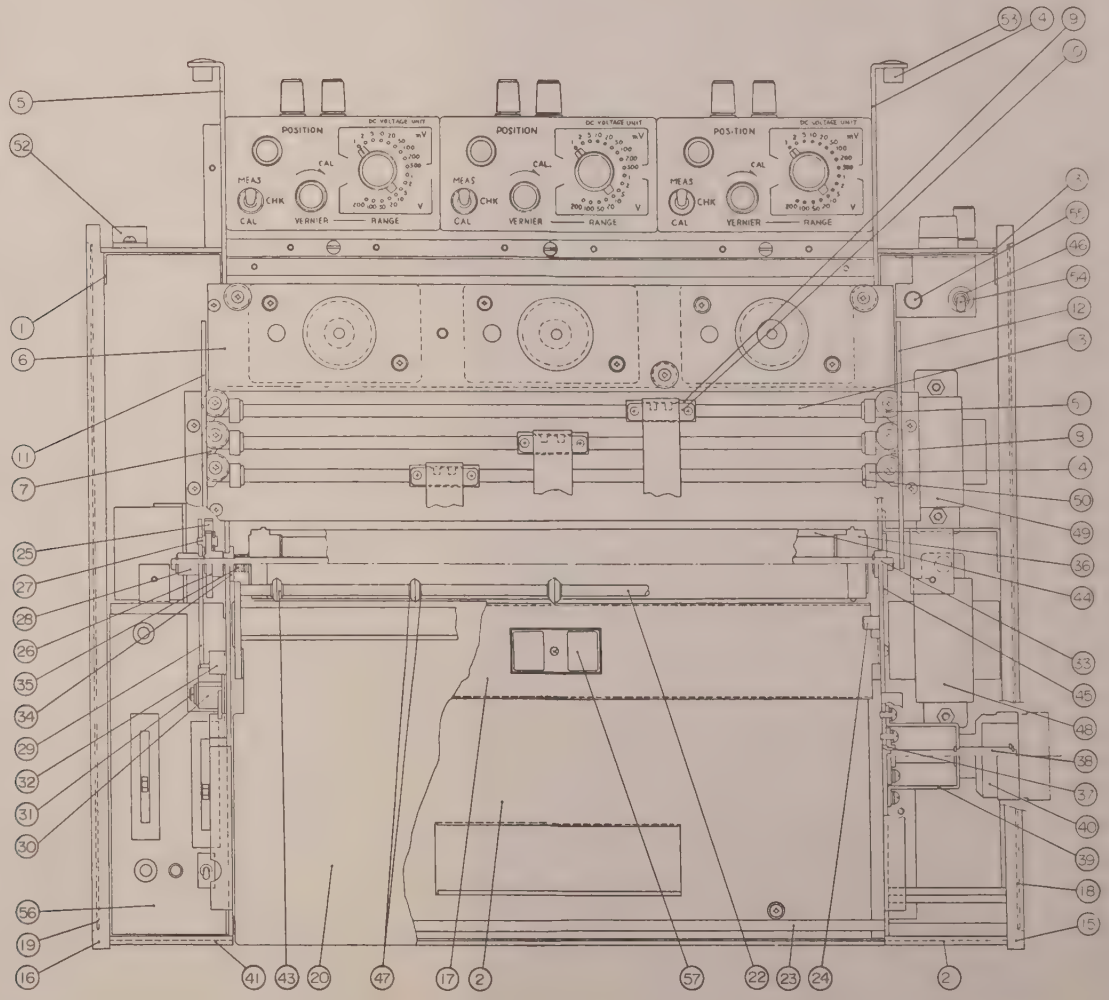
REVISIONS				
SYM	DESCRIPTION	DATE	CHK'D	APPR



157001
REV

AM	TITLE: Top View Mainframe, 1231-2	SOLTEC CORPORATION 157001

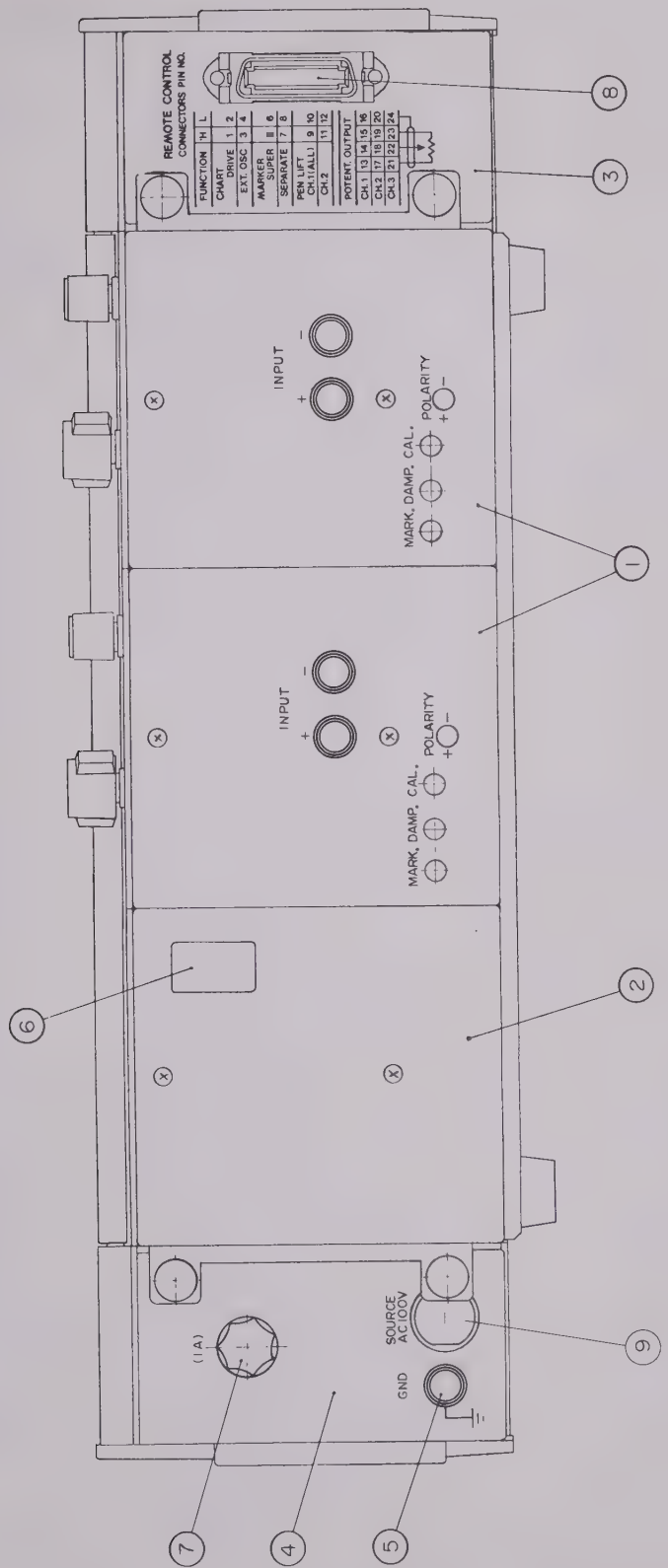
REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157002

BM	TITLE Top View Mainframe, 1243	SOLTEC CORPORATION 157002

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157003

REV

CM	TITLE	SOLTEC CORPORATION
	Rear View Mainframe, 1241-2	157003

Table 8.1 AM Top View, Mainframe Part List, 1241–2

Ref. No.	Part No.	Description
AM-1	225D02-1121	Right Side Plate
AM-2	225D02-1122	Left Side Plate
AM-3	225D02-1123	Right External Side Plate
AM-4	225D02-1124	Left External Side Plate
AM-5	225D02-1125-01	Chart Guide Plate 1
AM-6	225D02-1126-00	Chart Guide Plate 2
AM-7	225D02-1131	Chart Base Plate
AM-8	225D02-1134	Right Sleeve Plate
AM-9	225D02-1735	Left Sleeve Plate
AM-10	225D02-1137	Sub-Panel 3
AM-11	225D02-3274	Sub-Panel for Left Rear Panel
AM-12	225D02-1147	Chart Base Plate Rotation Shaft
AM-13	225D02-1185	Base Plate Stopper Shaft
AM-14	225D02-1322	Intermediate Gear
AM-15	225D02-1323	Drum Gear
AM-16	225D02-1324	Fixing Plate for Pulse Motor
AM-17	225D02-1325	Intermediate Gear Shaft
AM-18	225D02-1326	Arm Boss
AM-19	225D02-1327	Intermediate Gear Arm
AM-20	225D02-1330	Chart Free Lever
AM-21	225D02-1331	Chart Free Shaft
AM-22	225D02-1338	Chart Free Stopper
AM-23	225D02-1421	Mounting Plate for Servo Unit Assembly
AM-24	225D02-1422	Servo Motor Pulley (To be used only for 2 CH)
AM-25	225D02-1521	Drum Shaft
AM-26	225D02-1522	Drum Bearing
AM-27	225D02-1523	Drum Pressing Spring
AM-29	225D02-1621	Rewind Shaft Bearing
AM-30	225D02-1622	Rewind Shaft Bearing
AM-31	225D02-1624	Rewind Shaft
AM-32	225D02-1625	Rewind Holder
AM-33	225D02-1628	Rewind Wheel
AM-34	225D02-1821	Pen Holder
AM-35	225D02-1827	Pen Guide Shaft
AM-36	225D02-1829	Stopper for Pen Carriage
AM-37	225D02-1830	Pen Carriage
AM-38	225D02-1831	Side Plate 1
AM-39	225D02-1832	Side Plate 2
AM-40	225D03-00-1822	Pen Wire Fixing Plate 2
AM-41	301-41-001	Chart Guide Roller A
AM-42	304-99-001-02	Drum
AM-43	311-33-001	Drum Shaft Bearing
AM-44	5103-18	Crescent Ring
AM-45	PT-207	Power Transformer
AM-46	P-5	O Ring

Ref. No.	Part No.	Description
AM-47	K4-13Eh	Bearing
AM-48	TB-300	Collar Bushing
AM-49	M-2022	Power Switch
AM-50	BNF-3	Power Indicator Lamp
AM-51	225D02-1129-01	External Plate Cover 01
AM-52	225D02-1129-02	External Plate Cover 02
AM-53	225D02-1526	Sprocket Wheel
AM-54	225D02-3079	Recording Chart Reference Plate
AM-58	PM-276	Printed Circuit Board
AM-59	SW-291	Printed Circuit Board

Table 8.2 BM Top View, Mainframe Part List, 1243

Ref. No.	Part No.	Description
BM-1	325D01-00-1128	Left Rear Sub-Panel
BM-2	325D01-00-1135-01	Chart Guide Plate 1
BM-3	325D01-00-1156	Right Rear Sub-Panel 56
BM-4	325D01-00-1159	Right Side Plate
BM-5	325D01-00-1160	Left Side Plate
BM-6	325D01-00-1421-01	Mounting Plate for Servo Unit Assembly
BM-7	325D01-00-1422	Bearing Metal Fixture 1
BM-8	325D01-00-1423	Bearing Metal Fixture 2
BM-9	325D01-00-1825	Pen Carriage
BM-10	325D01-00-1826	Pen Wire Fixing Plate
BM-11	325D01-00-1828	Pen Unit Side Plate, Left
BM-12	325D01-00-1829	Pen Unit Side Plate, Right
BM-13	325D01-00-1830	Pen Guide Shaft
BM-14	325D01-00-1831	Stopper for Pen Carriage
BM-15	225D02-1123	Right External Side Plate
BM-16	225D02-1124	Left External Side Plate
BM-17	225D02-1126-00	Chart Guide Plate 2
BM-18	225D02-1129-01	External Plate Cover
BM-19	225D02-1129-02	External Plate Cover
BM-20	225D02-1131-00	Chart Base Plate
BM-21	225D02-1134	Right Sleeve Plate
BM-22	225D02-1143	Chart Pressing Roller
BM-23	225D02-1147	Chart Base Plate Rotation Shaft
BM-24	225D02-1185	Base Plate Stopper Shaft
BM-25	225D02-1322	Intermediate Gear
BM-26	225D02-1323	Drum Gear
BM-27	225D02-1325	Intermediate Gear Shaft
BM-28	225D02-1326	Arm Boss
BM-29	225D02-1327	Intermediate Gear Arm
BM-30	225D02-1330	Chart Free Lever
BM-31	225D02-1331	Chart Free Shaft
BM-32	225D02-1338	Chart Free Stopper
BM-33	225D02-1521	Drum Shaft
BM-34	225D02-1522	Drum Bearing
BM-35	225D02-1523	Drum Pressing Spring
BM-36	225D02-1526	Sprocket Wheel
BM-37	225D02-1622	Rewind Shaft Bearing 2
BM-38	225D02-1624	Rewind Shaft
BM-39	225D02-1625	Rewind Holder
BM-40	225D02-1628	Rewind Wheel
BM-41	225D02-1135	Left Sleeve Plate
BM-43	301-41-001	Chart Guide Roller A
BM-44	304-99-001-02	Drum
BM-45	311-33-001	Drum Shaft Bearing
BM-46	314-33-001	Decorative Nut for Snap Switch
BM-47	5103-18	Crescent Ring
BM-48	PT-239	Power Transformer

Ref. No.	Part No.	Description
BM-49	PT-240	Power Transformer
BM-50	P-6	O Ring
BM-51	K4-14Eh	Bearing
BM-52	57-40240	Connector – Receptacle – 24 Pin
BM-53	DP-375	Hole Plug
BM-54	M-2022	Power Switch
BM-55	BNF-3	Power Indicator Lamp
BM-56	PM-276	Printed Circuit Board
BM-57	SW-291	Printed Circuit Board

Table 8.3 CM Rear View, Mainframe Part List, 1241–2

Ref. No.	Part No.	Description
CM-1	225D02-2851	AMP Rear Panel
CM-2	225D02-2854-02	AMP Rear Blind Panel
CM-3	225D02-3273	Left Rear Panel
CM-4	225D02-2861	Right Rear Panel
CM-5	317-12-901-05	Type 2 Terminal, Metal
CM-6	DKS-07-1	Cord Clamp
CM-7	S-I 7221-05	Fuse Holder
CM-8	57-40240	Connector – Receptacle – 24 Pin
CM-9	SR-6N-4	Cord Bushing

SECTION 9

ELECTRICAL SCHEMATICS AND PARTS

9.1 ORDERING INFORMATION

When you need an electrical replacement part, buy from commercial sources or order from Soltec Corporation in the following procedure:

A. Find the number of the required part from the schematics or the board assembly diagrams.

B. Add the number after the two letters given in parentheses which are in the title of each drawing.

C. For example, if the part you require is in AR Models 1241–2, Block Diagram Mainframe Interconnections and the part number is C1, then its reference number is AR-C1.

D. With this reference number, find the number and rating from the parts list.

E. In the above example, Table 9.1 lists Ref. No. AR-C1 as:

Part No.: DE7150FZ 103P
Rating: Capacitor - 0.01μF - $^{+100\%}_{-\ 0\%}$ - 400V AC - Paper

F. If you buy this part from commercial sources, use the listed rating.

G. You can also order the part from Soltec Corporation at the address given below, giving the part name, number and rating.

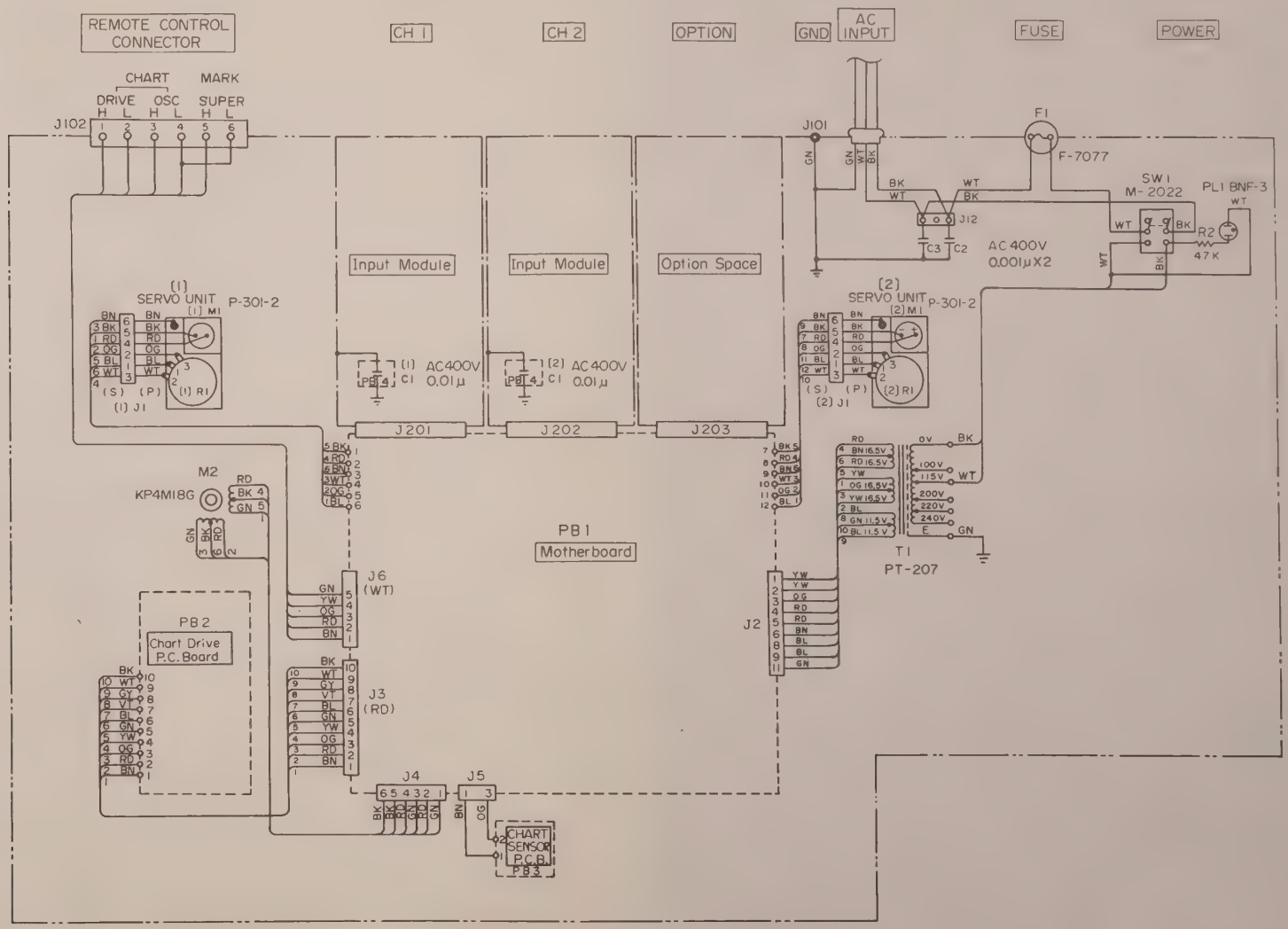
Customer Service Department
Soltec Corporation
11684 Pendleton Street
Sun Valley, California 91352
Phone: (213) 767-0044

H. It should be noted that rating and specifications given in this parts list are typical ones and equivalents with different parts numbers may be used in the recorders.

9.2 ELECTRICAL SCHEMATICS AND PARTS LIST

9.2.1 List of P.C. Board Assembly Component Location Drawings and Schematics

Ref. No.	Title	Assembly Drawing No.	Schematic Diagram No.
AR	Models 1241-2 Block Diagram Mainframe Interconnections	—	157101
BR	Model 1243 Block Diagram Mainframe Interconnections	—	157102
CR	Motherboard, 1241-2	157111	157112
DR	Motherboard, 1243	157113	157114
ER	Chart Drive, 1241-3	157121	157122
AU	MODULE A Attenuator, 1241-3	—	157131
BU	MODULE B Attenuator, 1241-3	—	157132
CU	MODULE C Attenuator, 1241-3	—	157133
DU	MODULE D, E & F Attenuator, 1241-3	—	157134
EU	MODULE 8 Attenuator, 1241-3	—	157135
FU	MODULE 8 Convertor, 1241-3	157136	157137
GU	MODULE A, B, C, D, E, F & 8 Amplifier, 1241-3	157138	157139
HU	MODULE 1 Attenuator, 1241-3	—	157141
IU	MODULE 1 Bias Circuit, 1241-3	157142	157143
JU	MODULE 2, 3, 4, 5 & 6 Attenuator, 1241-3	—	157144
KU	MODULE 7 Attenuator, 1241-3	—	157145
LU	MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier, 1241-3	157146	157147
MU	MODULE 1 (Linearized) Attenuator, 1241-3	—	157151
NU	MODULE 1 (Linearized) Bias Circuit, 1241-3	157152	157153
OU	MODULE 2, 3, 4, 5, 6 & 7 (Linearized) Attenuator, 1241-3	—	157154
PU	MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier, 1241-3	157155	157156
AO	OPTION 1 Chart Take-up, 1241-3	—	157201
BO1	OPTION 2 Event Marker, 1241-2	157211	157212
BO2	OPTION 2 Event Marker, 1243	Refer to 157211	157213
CO	OPTION 3 Electric Pen Lift, 1241-2	157221	157222
DO	OPTION 4 Electric Pen Lift, 1243	157223	157224
EO	OPTION 5 Electronic Limit Switch, 1241	157231	157232
FO	OPTION 6 Electronic Limit Switch, 1242	157233	157234
GO	OPTION 7 Electronic Limit Switch, 1243	157235	157236
HO	OPTION 10 Synchronizer, 1242	157241	157242
IO	OPTION 11 Synchronizer Interconnections, 1243	—	157243
	OPTION 11 Synchronizer, 1243	157244	157245
JO	OPTION 12 Retransmitting Potentiometer Output	—	157251

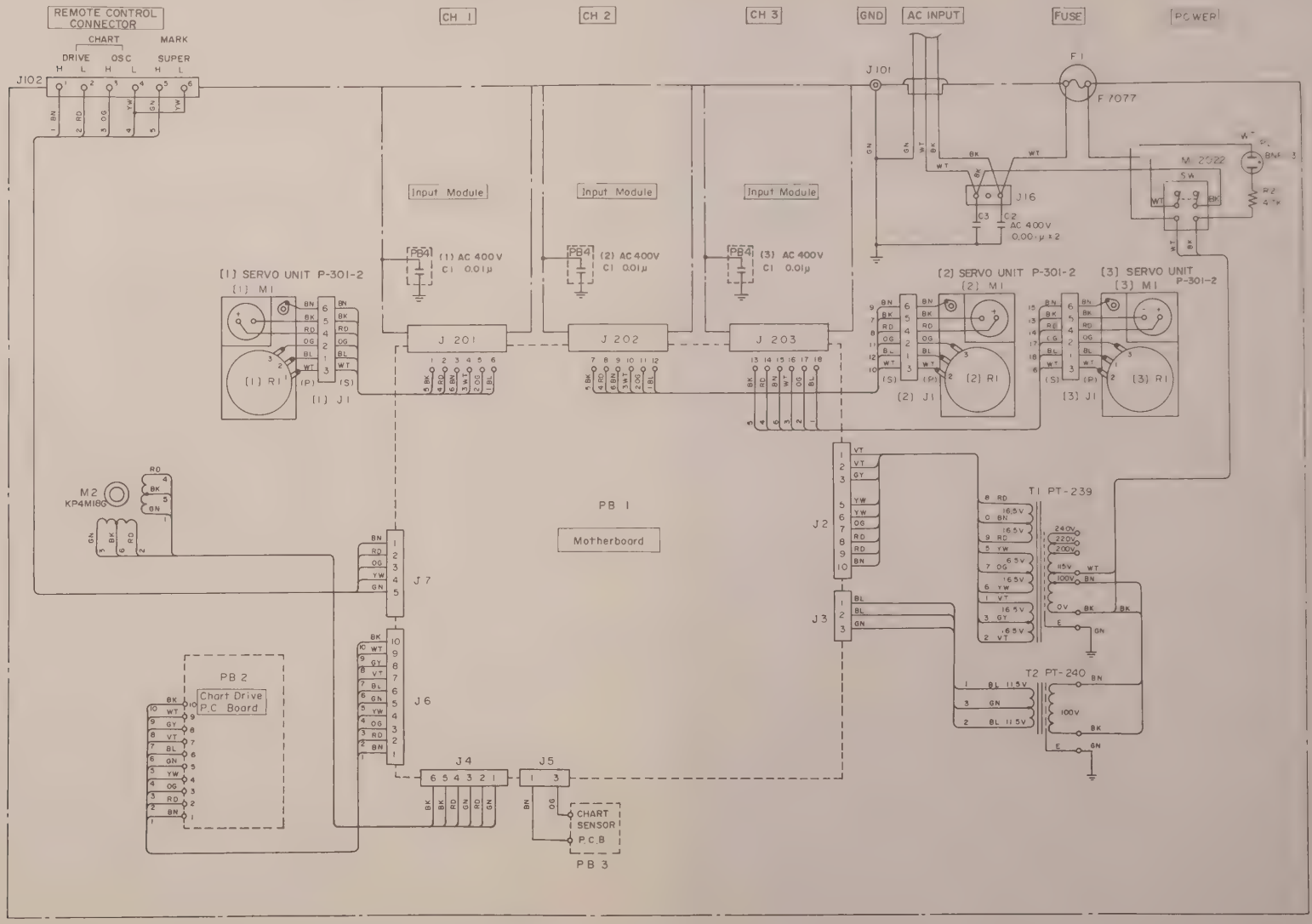


NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. [1] STANDS FOR CH1 SIDE.
4. [2] STANDS FOR CH2 SIDE.

5. WHEN INSTALLING OPTION 2, 3, 5, 6 AND/OR 10, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

AR	TITLE	SOLTEC CORPORATION
	Models 1241-2 Block Diagram Mainframe Interconnections	157101

REVISIONS				
SYM	DESCRIPTION	DATE	CHK'D	APPR



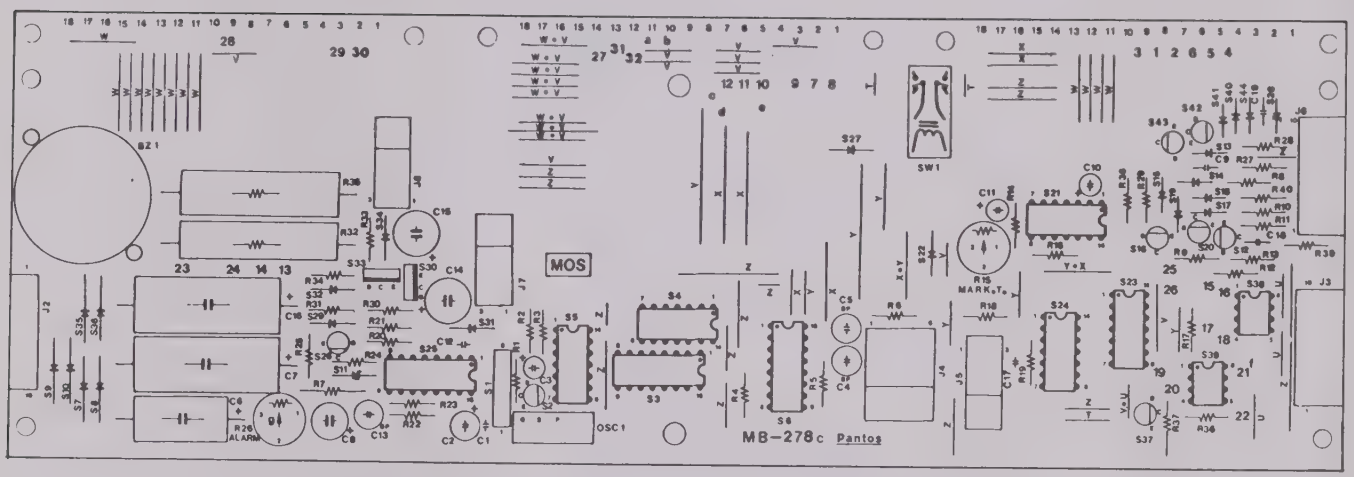
157102

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. [1] STANDS FOR CH1 SIDE.
4. [2] STANDS FOR CH2 SIDE.
5. [3] STANDS FOR CH3 SIDE.

6. WHEN INSTALLING OPTION 2, 4 AND/OR 11, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

BR	TITLE	SOLTEC CORPORATION
	Model 1243 Block Diagram Mainframe Interconnections	157102

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



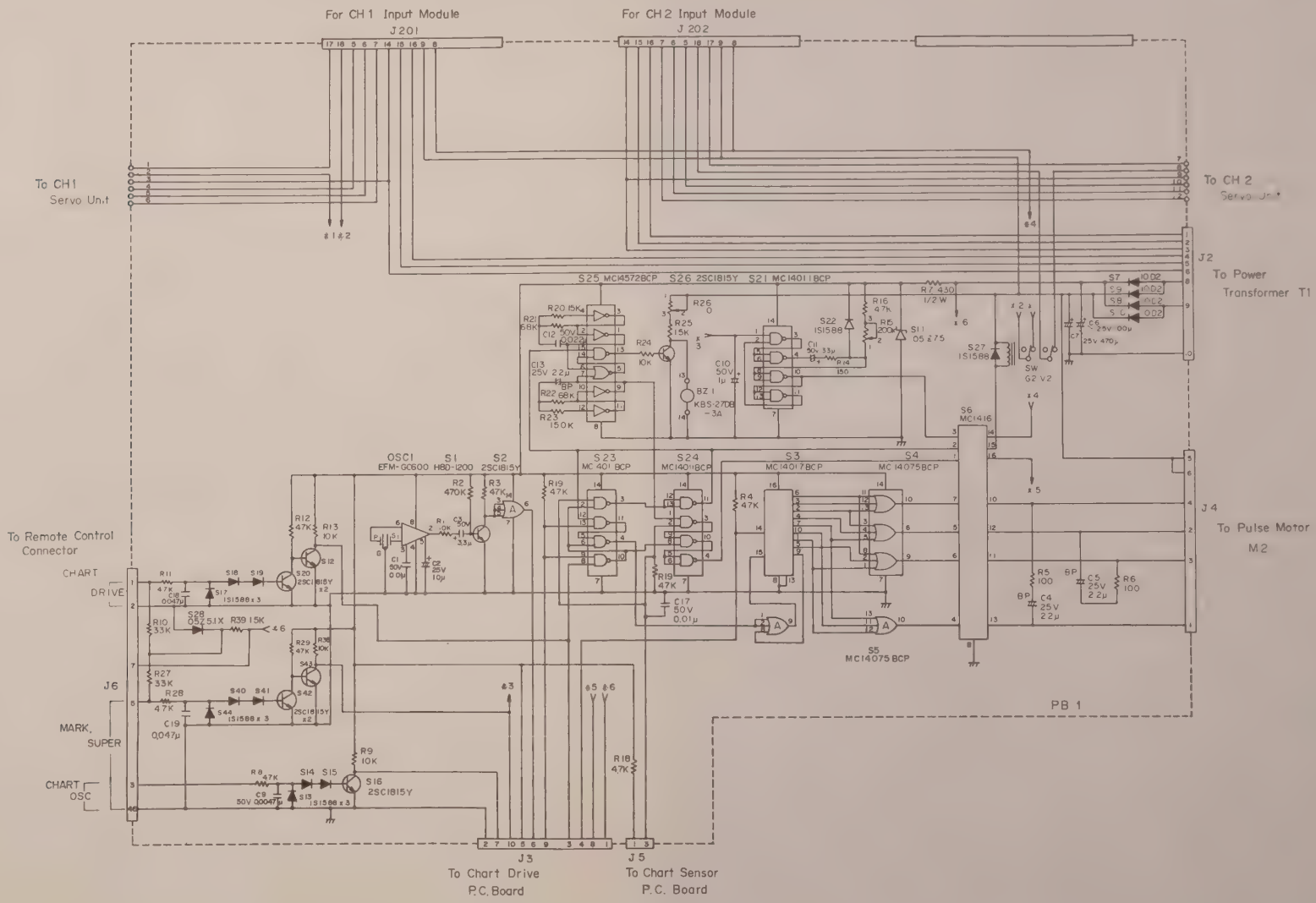
157111

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157112.
2. WHEN INSTALLING OPTION 2, 3, 5, 6 AND/OR 10, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

CR	TITLE Assembly Motherboard, 1241-2	SOLTEC CORPORATION 157111

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157112

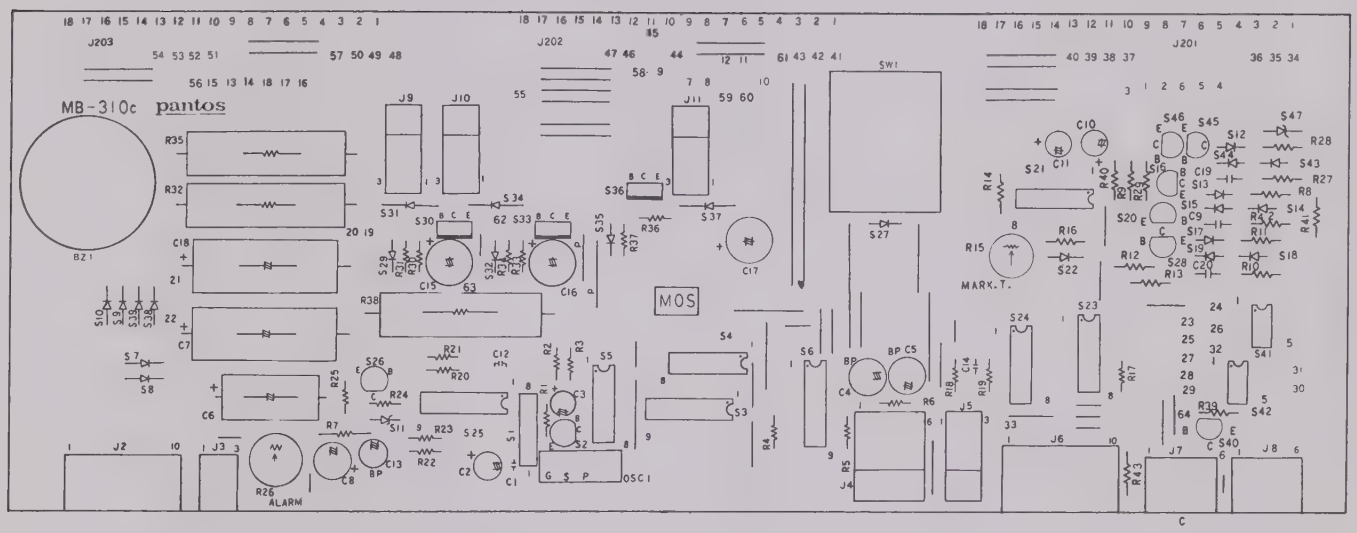
CAUTION
MOS semiconductors are used.
Use Static Precautions.

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157111.

4. WHEN INSTALLING OPTION 2, 3, 5, 6 AND/OR 10, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

CR	TITLE	SOLTEC CORPORATION
	Schematic Dia. Motherboard, 1241-2	157112

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

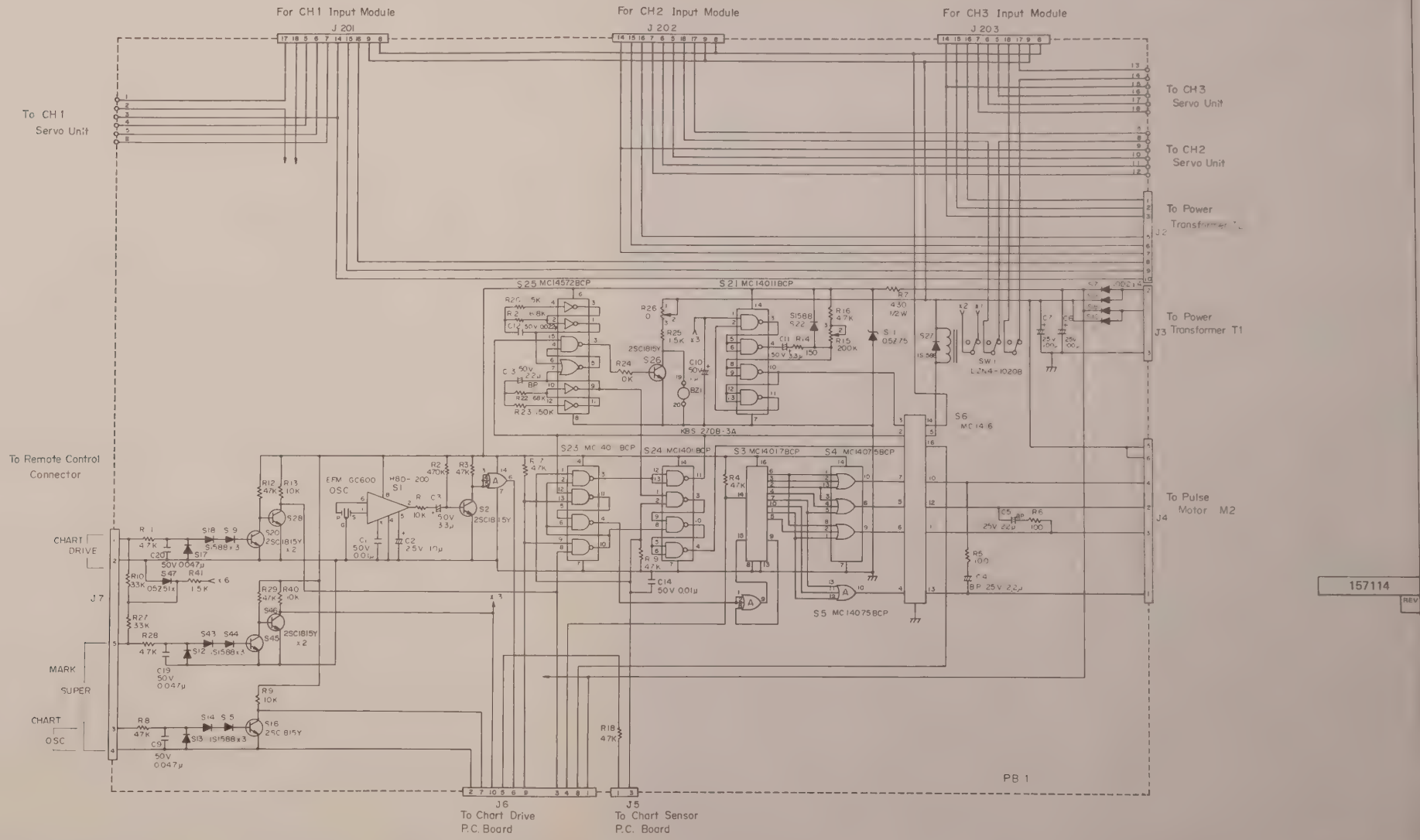


157113

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157114.
2. WHEN INSTALLING OPTION 2, 4 AND/OR 11, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

DR	TITLE	SOLTEC CORPORATION
	Assembly Motherboard, 1243	157113



CAUTION
MOS semiconductors are used.
Use Static Precautions.

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157113.

4. WHEN INSTALLING OPTION 2, 4 AND/OR 11, MINOR CIRCUIT ADDITION ON MOTHERBOARD REQUIRED. SEE EACH SCHEMATIC FOR DETAILS.

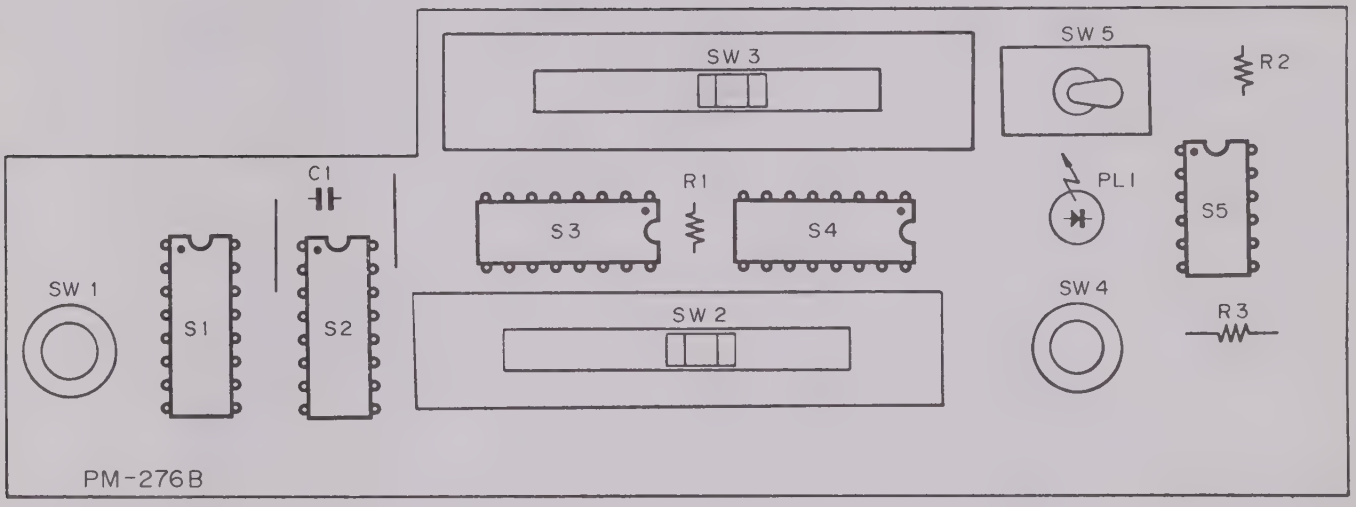
DR

TITLE
Schematic Dia.
Motherboard,
1243

SOLTEC CORPORATION

157114

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



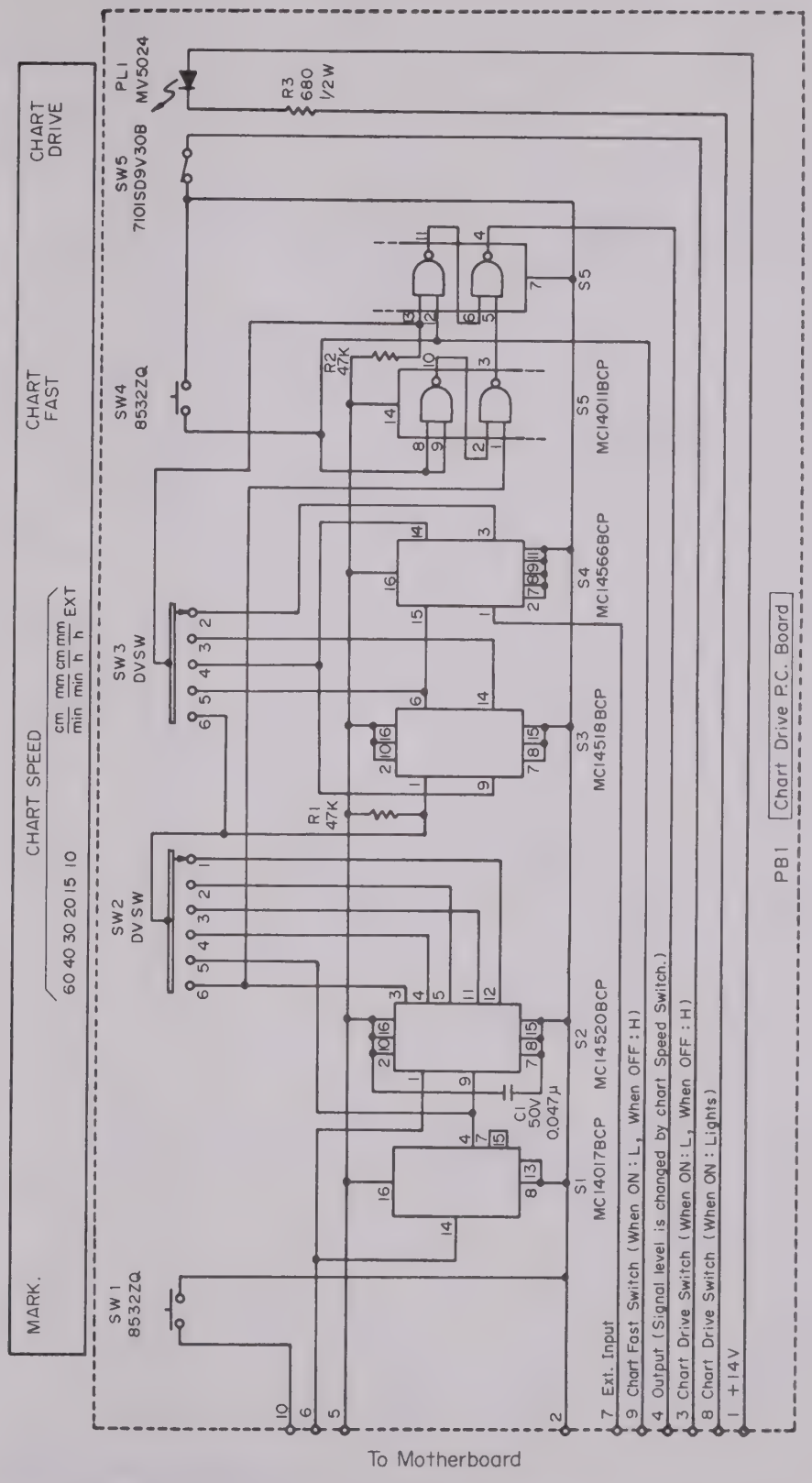
157121

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157122.

ER	TITLE Assembly Chart Drive, 1241-3	SOLTEC® CORPORATION 157121

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



To Motherboard

CAUTION
MOS semiconductors are used.
Use Static Precautions.

157122
REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. CAPACITOR IS IN FARADS.
3. REFER TO ASSEMBLY NO. 157121.

ER

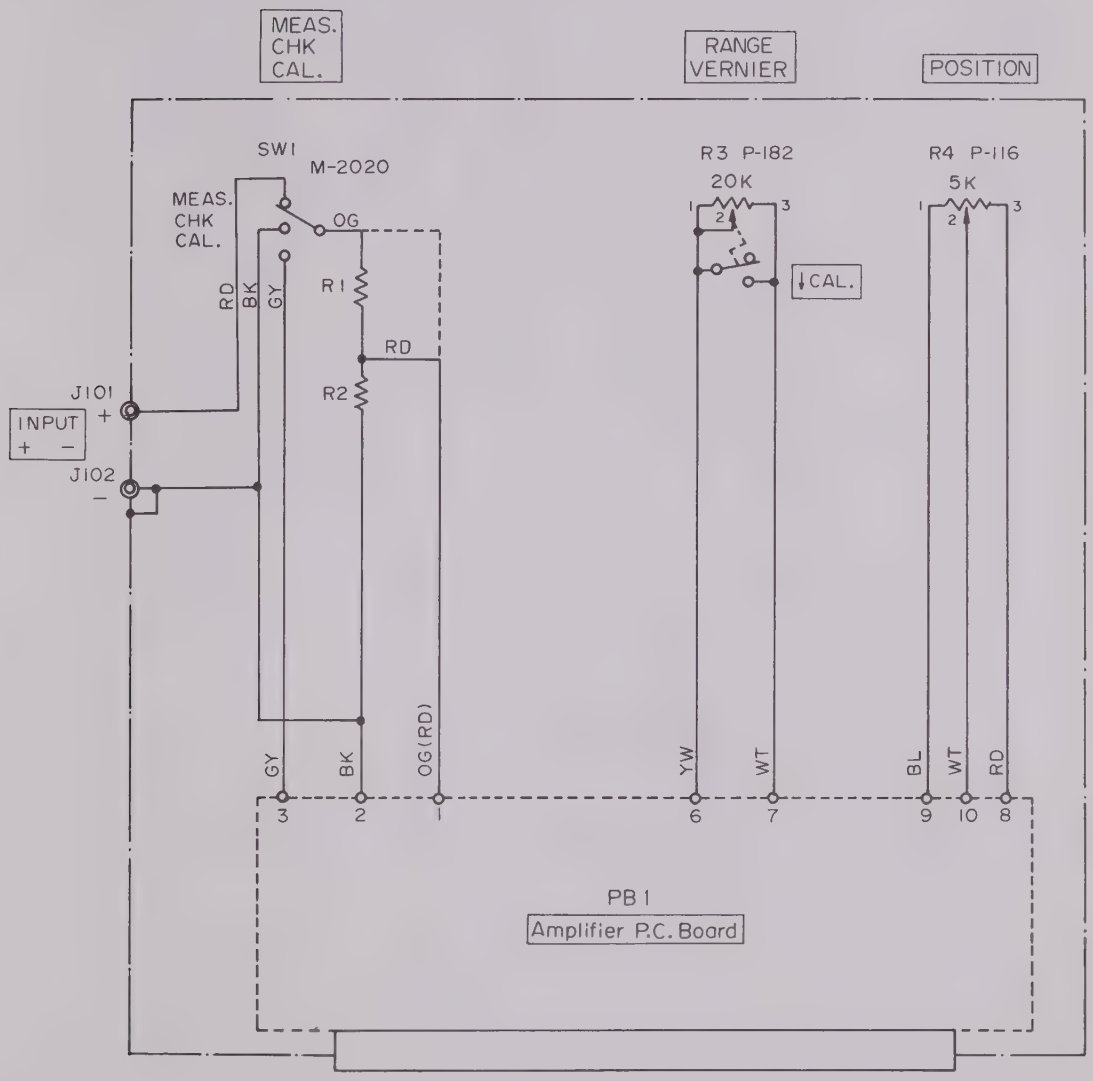
TITLE

Schematic Dia.
Chart Drive,
1241-3

SOLTEC CORPORATION

157122

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157131

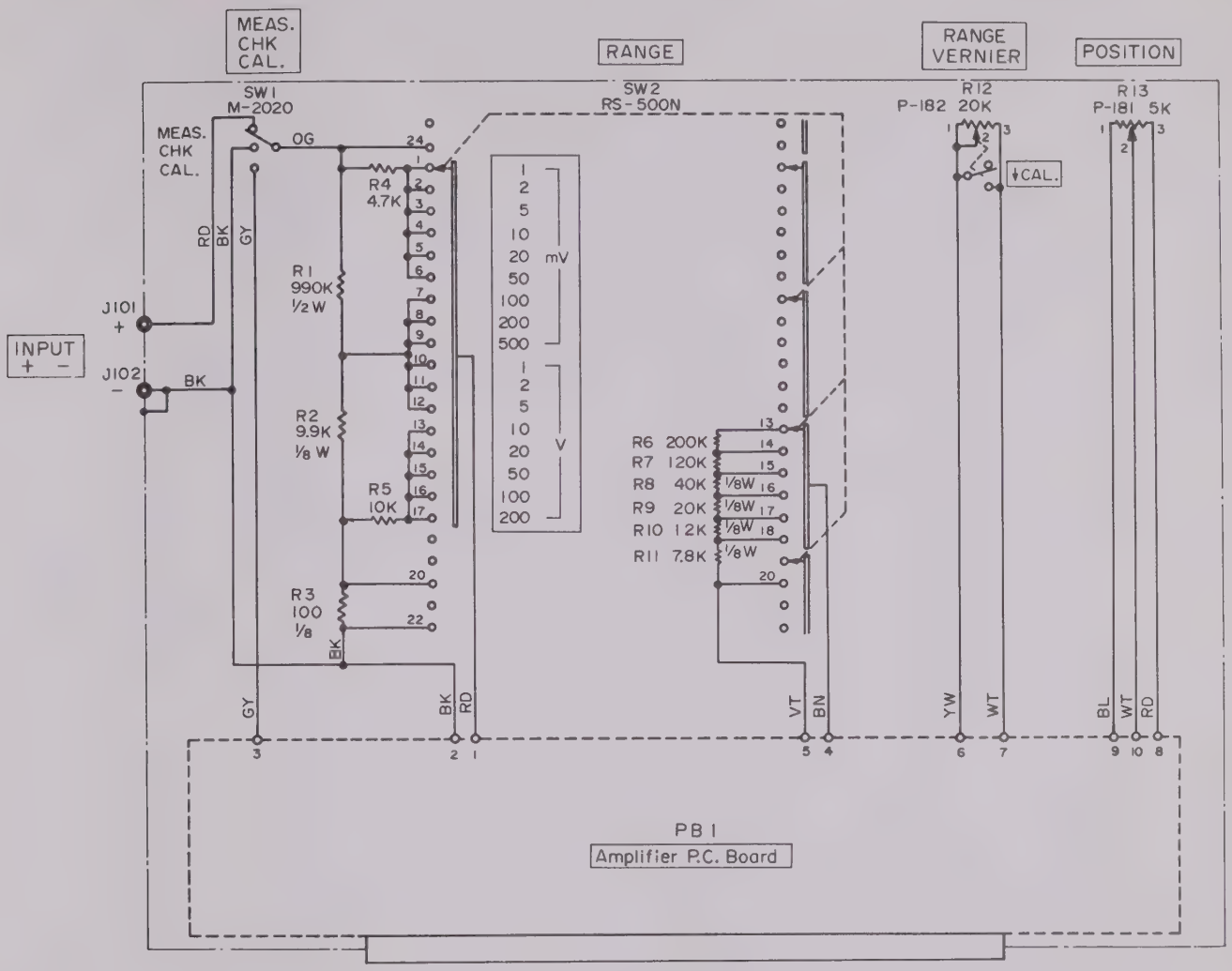
REV

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO TABLE 9.6.1 FOR R1 AND R2.
3. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157138 AND 157139 FOR DETAILS.

AU	TITLE Schematic Dia. MODULE A Attenuator, 1241-3	SOLTEC® CORPORATION	157131

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157132

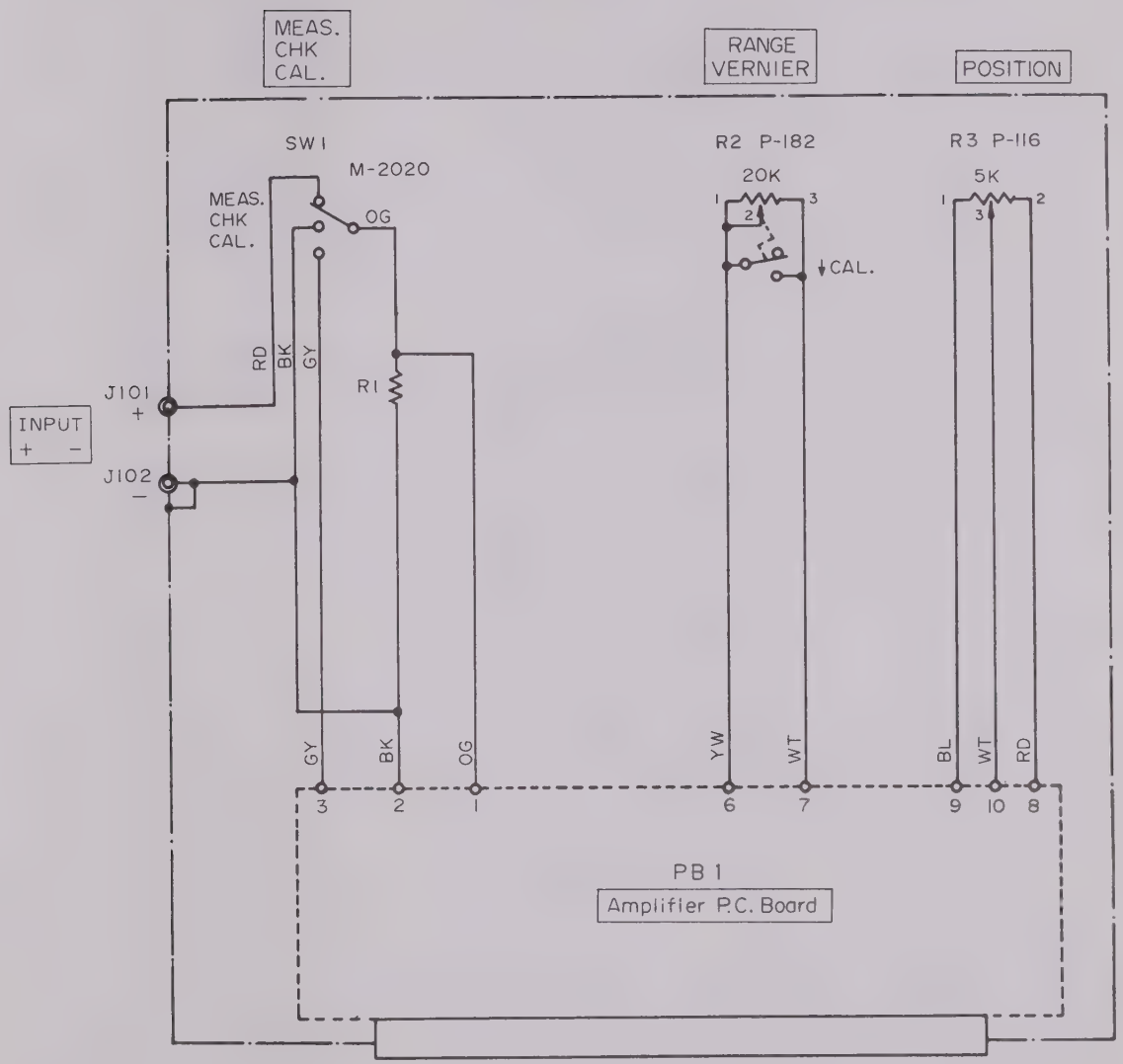
REV

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157138 AND 157139 FOR DETAILS.

BU	TITLE	SOLTEC® CORPORATION
	Schematic Dia. MODULE B Attenuator, 1241-3	157132

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157133

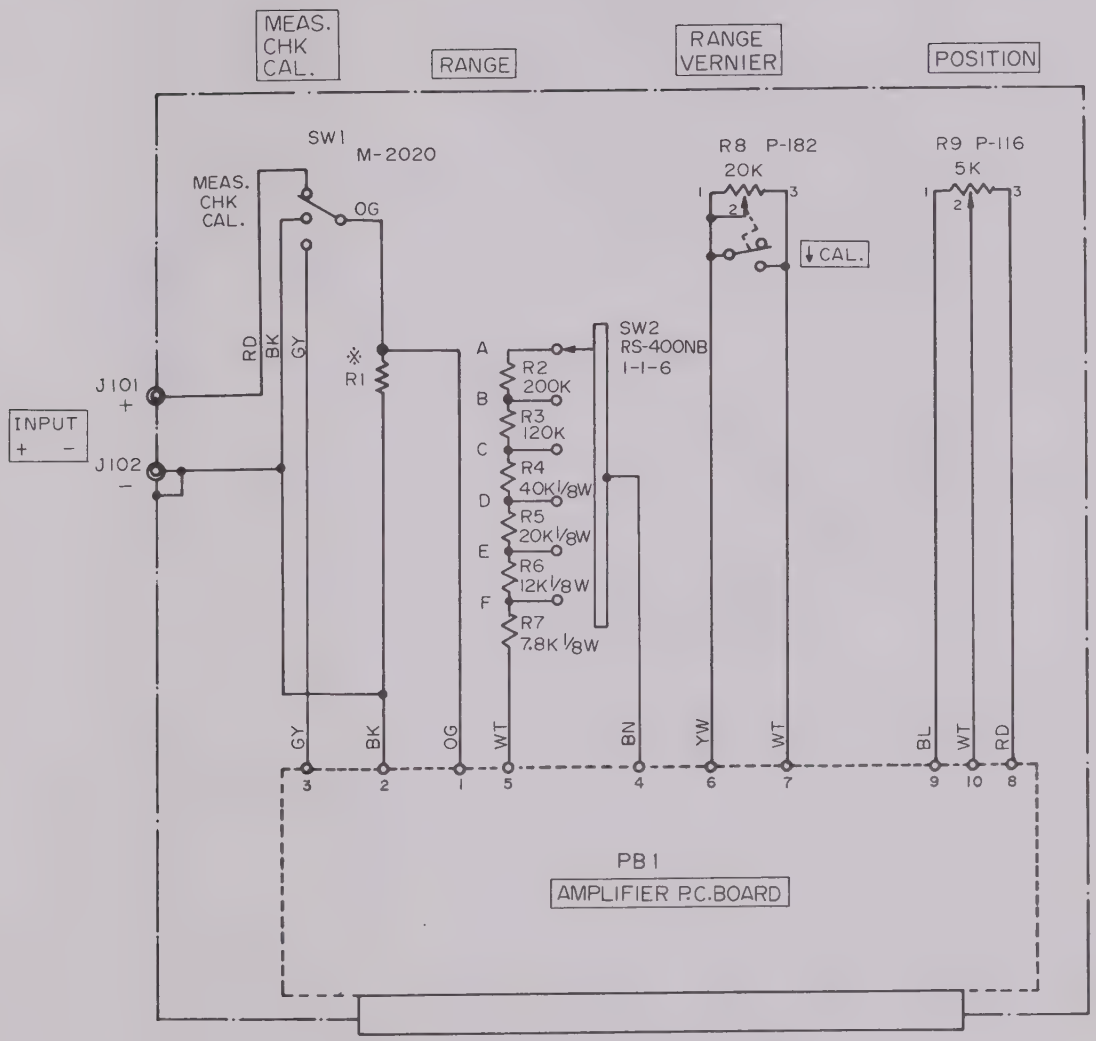
REV

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO TABLE 9.8.1 FOR R1.
3. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157138 AND 157139 FOR DETAILS.

CU	TITLE	SOLTEC® CORPORATION
	Schematic Dia. MODULE C Attenuator, 1241-3	157133

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157134

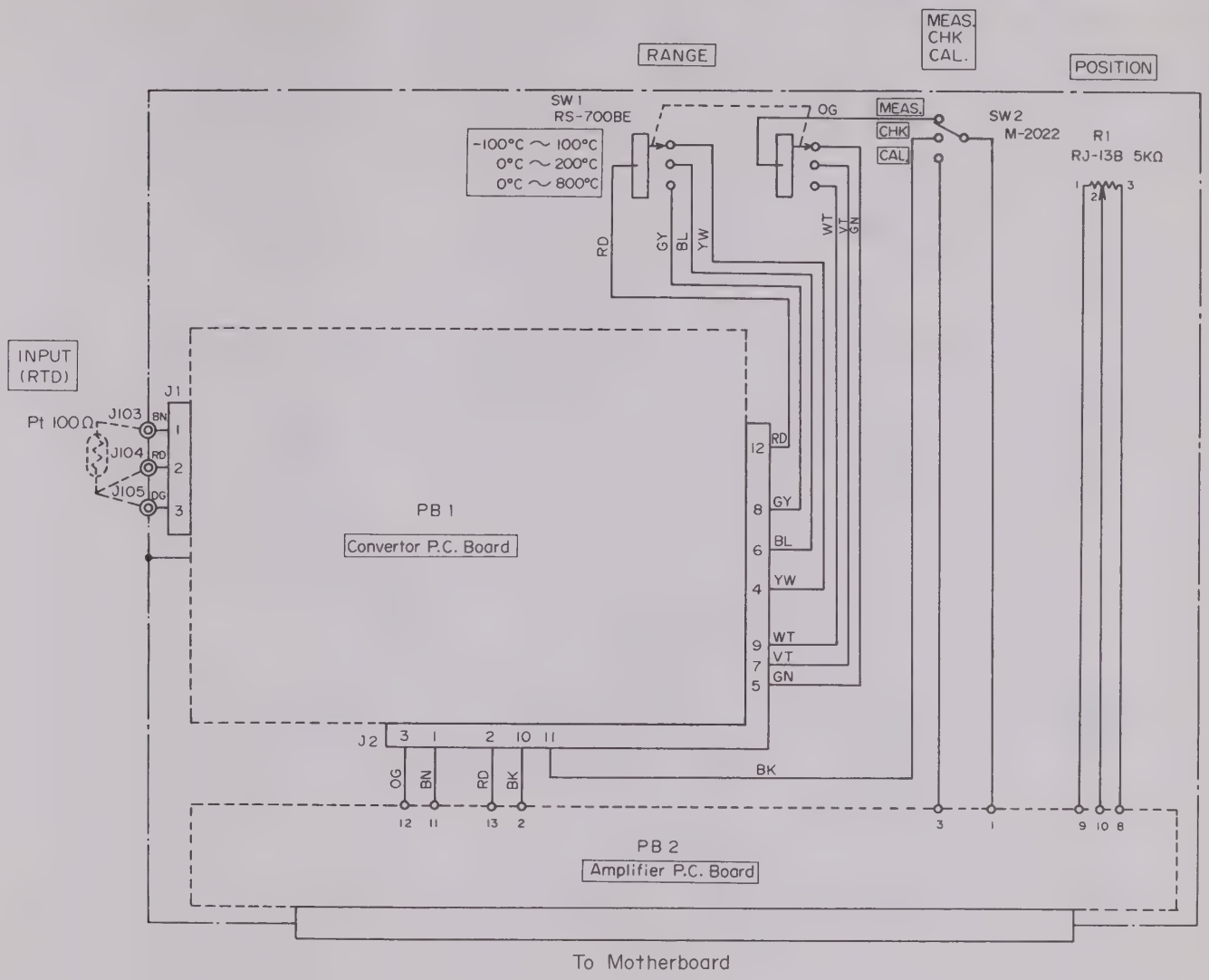
REV

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO TABLE 9.9.1 FOR R1.
3. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157138 AND 157139 FOR DETAILS.

DU	TITLE	SOLTEC® CORPORATION
	Schematic Dia. MODULE D, E & F Attenuator, 1241-3	157134

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



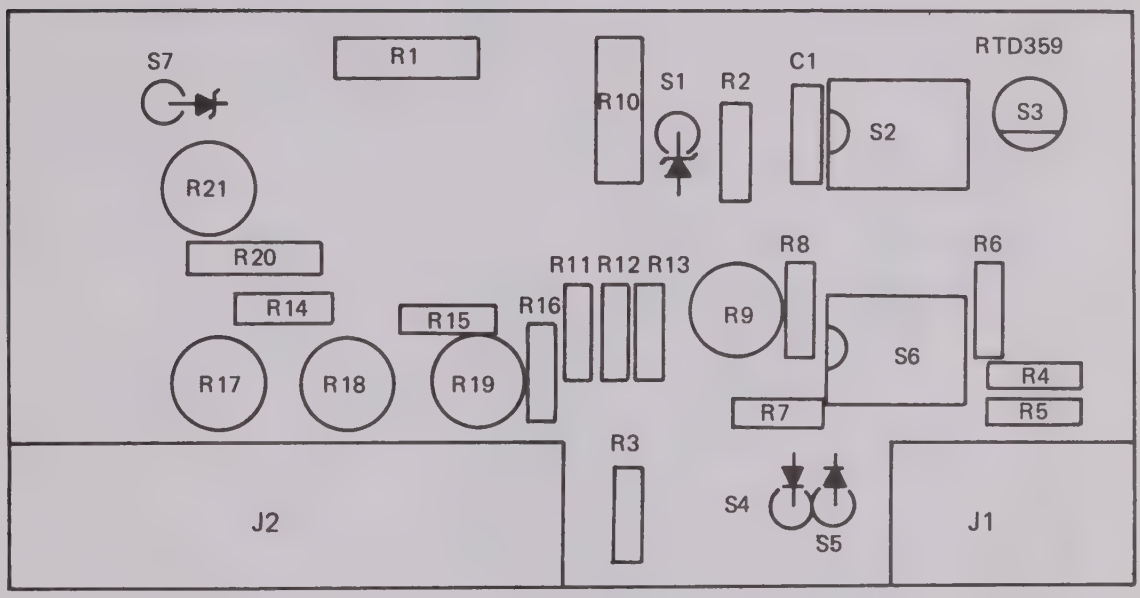
157135

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157137 FOR CONVERTOR.
2. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157138 AND 157139 FOR DETAILS.

EU	TITLE	SOLTEC CORPORATION
	Schematic Dia. MODULE 8 Attenuator, 1241-3	157135

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



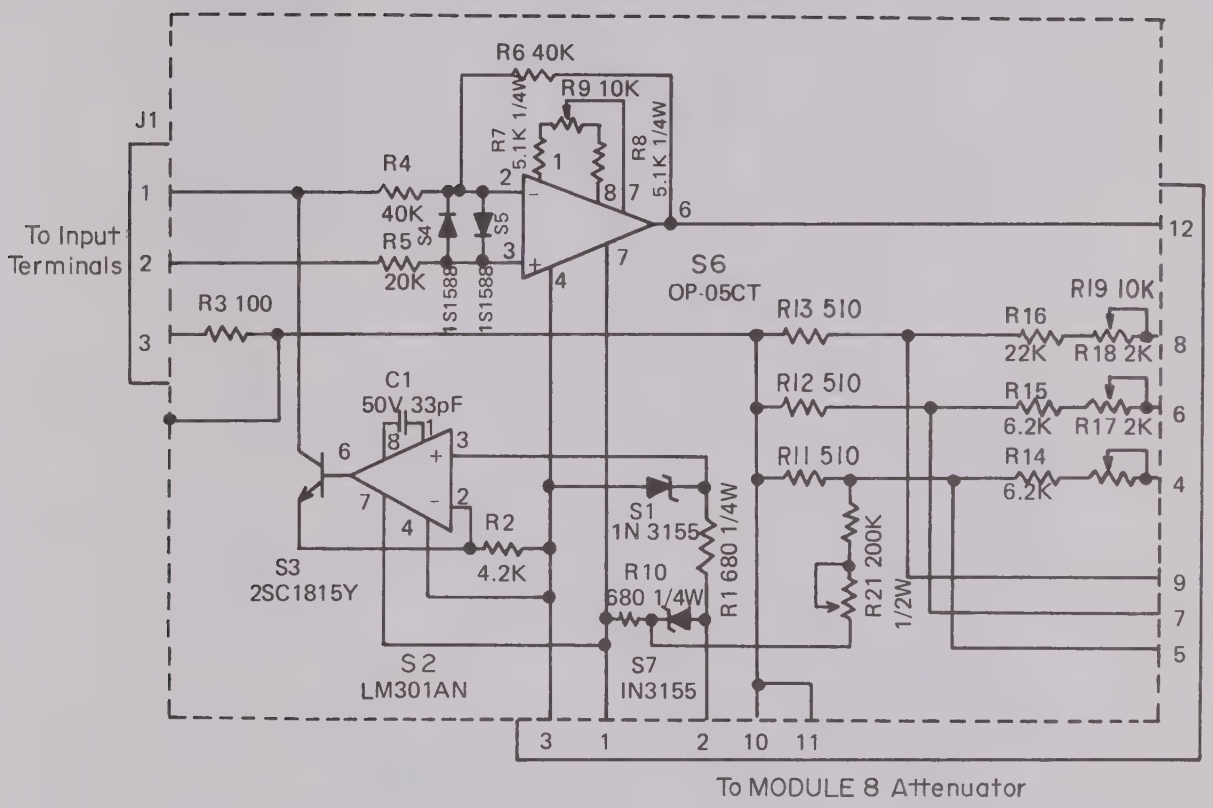
157136

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157137.

FU	TITLE Assembly MODULE 8 Convertor, 1241-3	SOLTEC® CORPORATION 157136

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



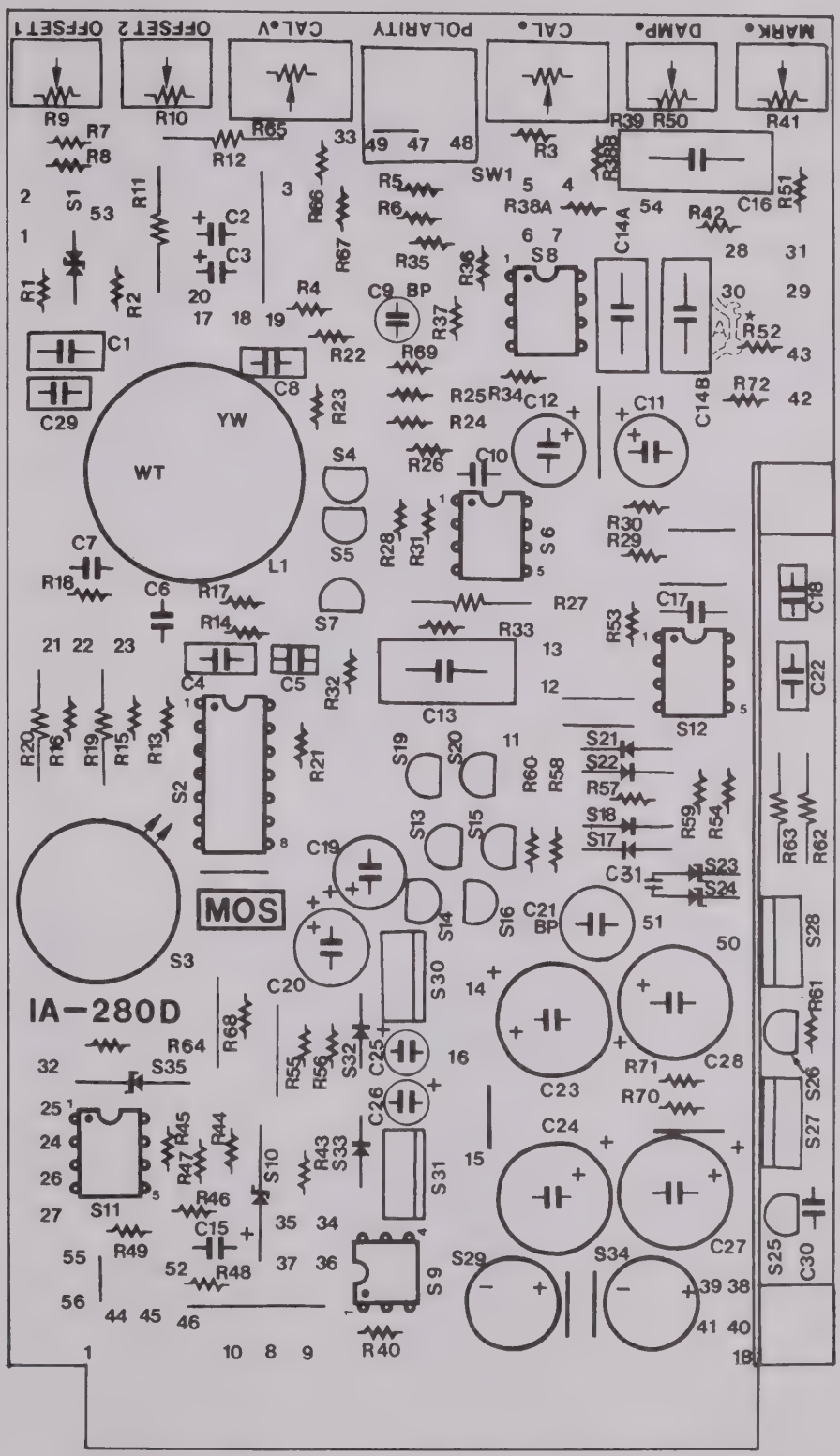
157137

REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/8W.
2. REFER TO ASSEMBLY NO. 157136.

FU	TITLE	SOLTEC CORPORATION
	Schematic Dia. MODULE 8 Convertor, 1241-3	157137

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

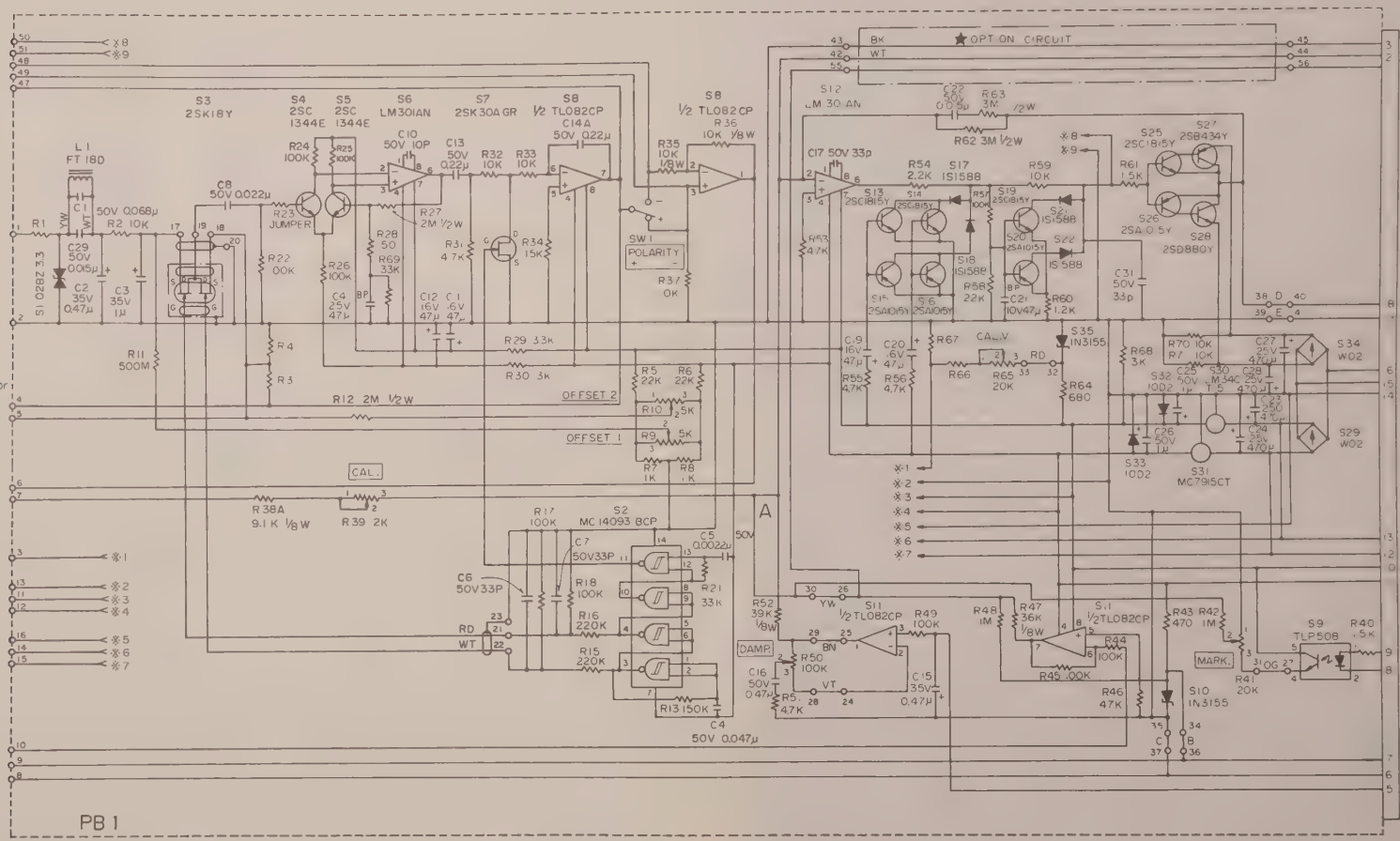


157138 REV

NOTE: 1. REFER TO SCHEMATIC NO. 157139.
2. WHEN INSTALLING SYNCHRONIZER TO RECORDER, JUMPER AT LAND NOS. 43–45, 42–44 AND 55–56 AND OPEN AT ★A FROM THE REAR OF P.C. BOARD.

GU	TITLE Assembly MODULE A,B,C, D,E, F & 8 Amplifier, 1241-3	SOLTEC CORPORATION 157138

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157139 REV

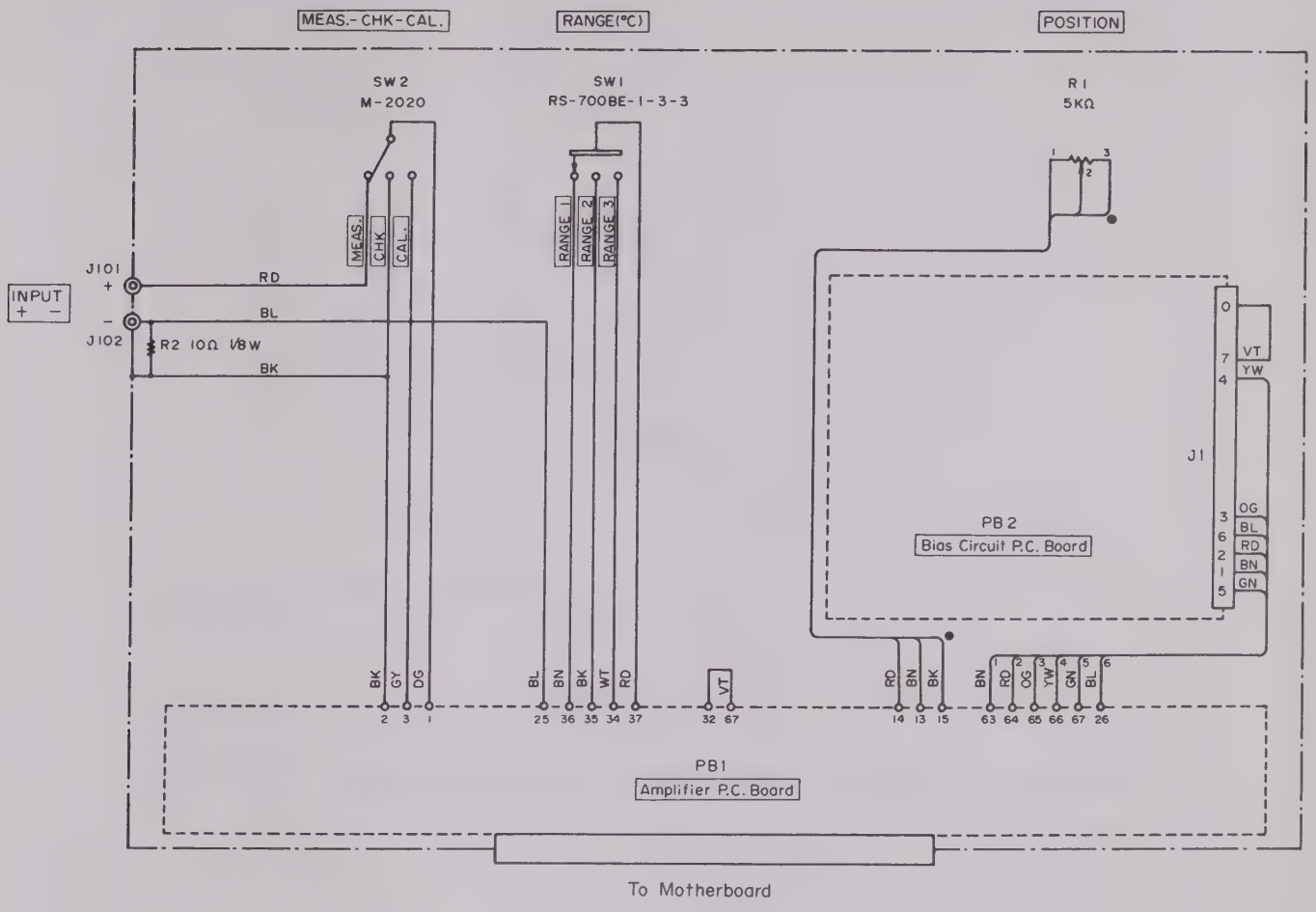
NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157138.
4. REFER TO TABLE 9.12.1 FOR R1, R3, R4, R66 AND R67.
5. ★OPTION CIRCUIT IS CONNECTED AND WIRING MARKED WITH A IS OPEN CIRCUITED ONLY WHEN SYNCHRONIZER IS INSTALLED.

CAUTION
MOS semiconductors are used.
Use Static Precautions.

GU	TITLE	SOLTEC CORPORATION
	Schematic Dia. MODULE A, B, C, D, E, F & 8 Amplifier, 1241-3	157139

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



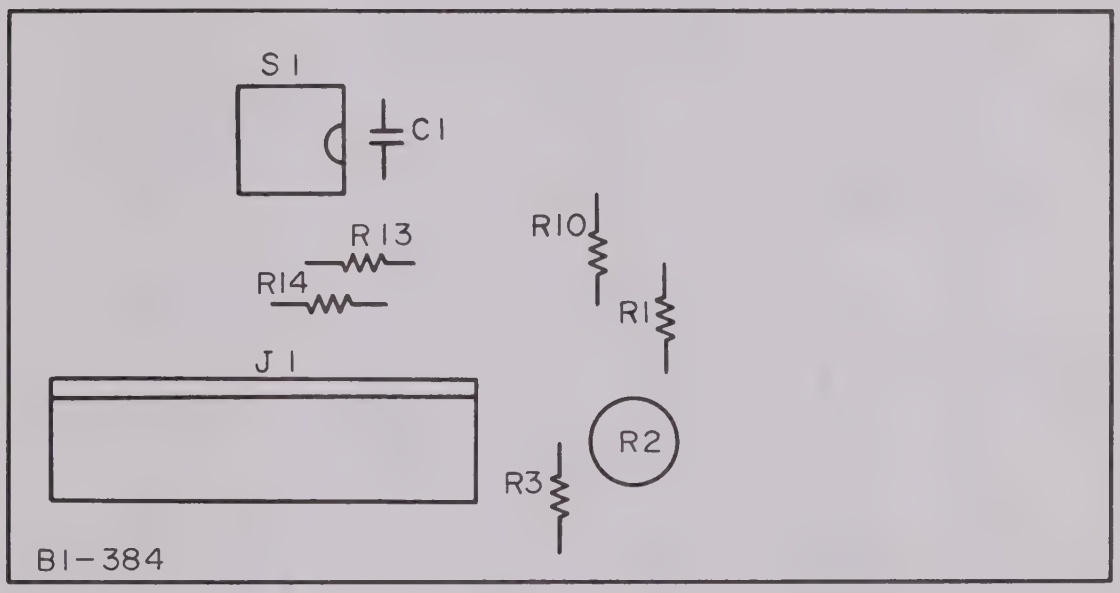
157141

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157143 FOR BIAS CIRCUIT.
2. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157146 AND 157147 FOR DETAILS.

HU	TITLE Schematic Dia. MODULE 1 Attenuator, 1241-3	SOLTEC CORPORATION 157141

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



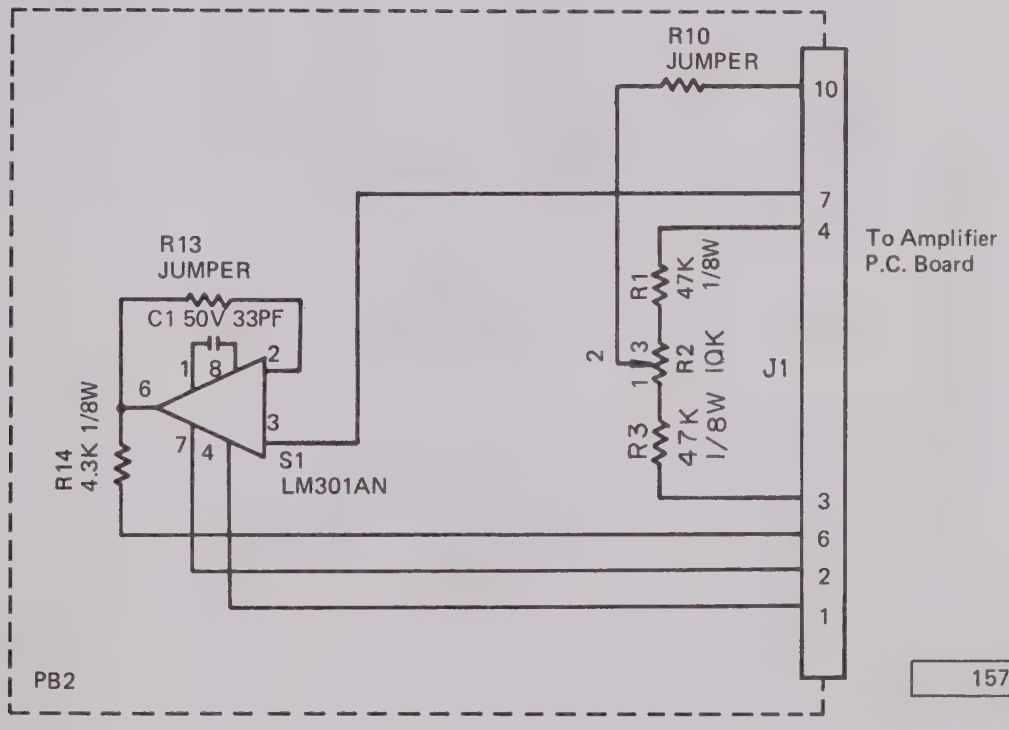
157142

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157143.

IU	TITLE Assembly MODULE 1 Bias Circuit, 1241-3	SOLTEC® CORPORATION 157142

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



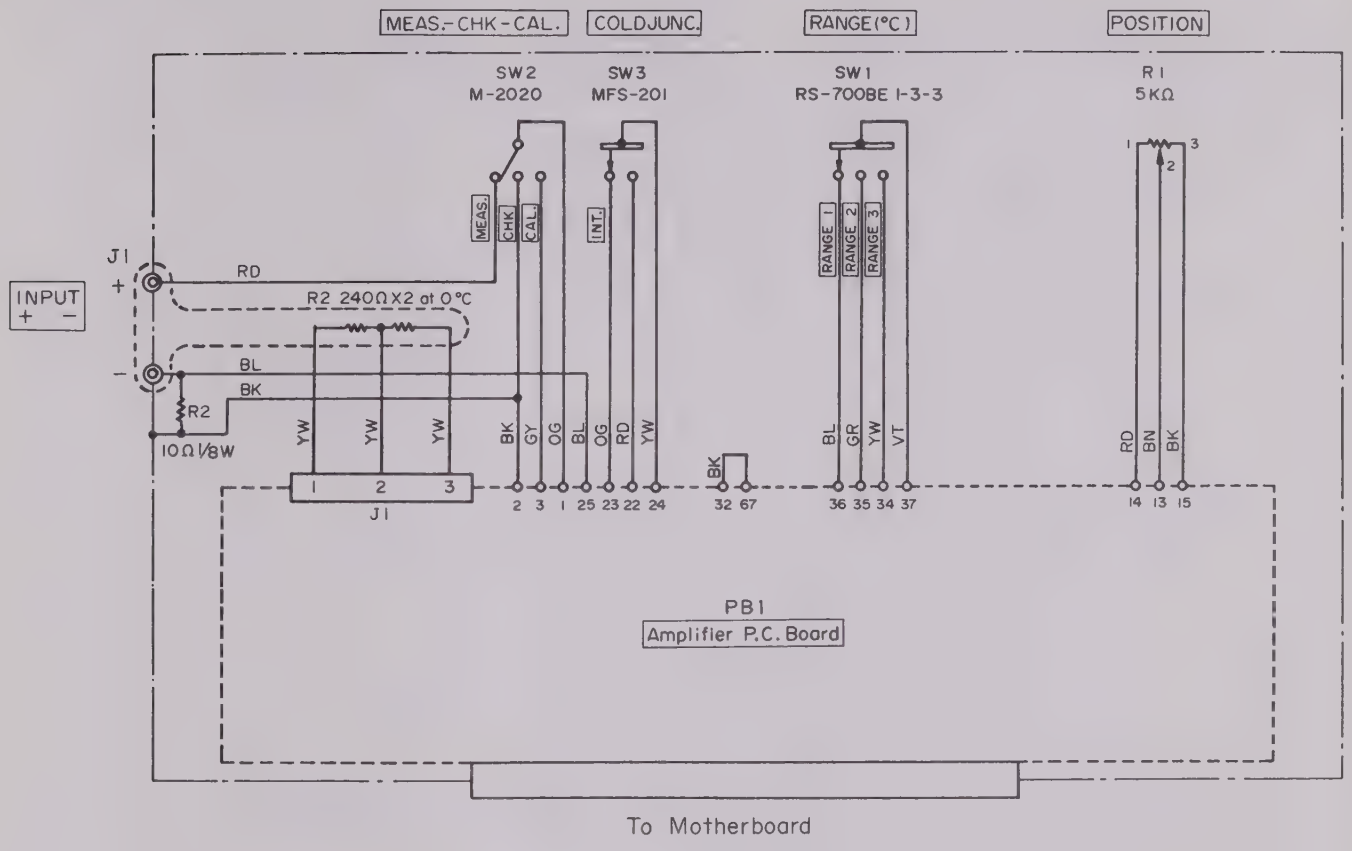
157143

REV

NOTE: REFER TO ASSEMBLY NO. 157142.

IU	TITLE Schematic Dia. MODULE 1 Bias Circuit, 1241-3	SOLTEC CORPORATION 157143

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



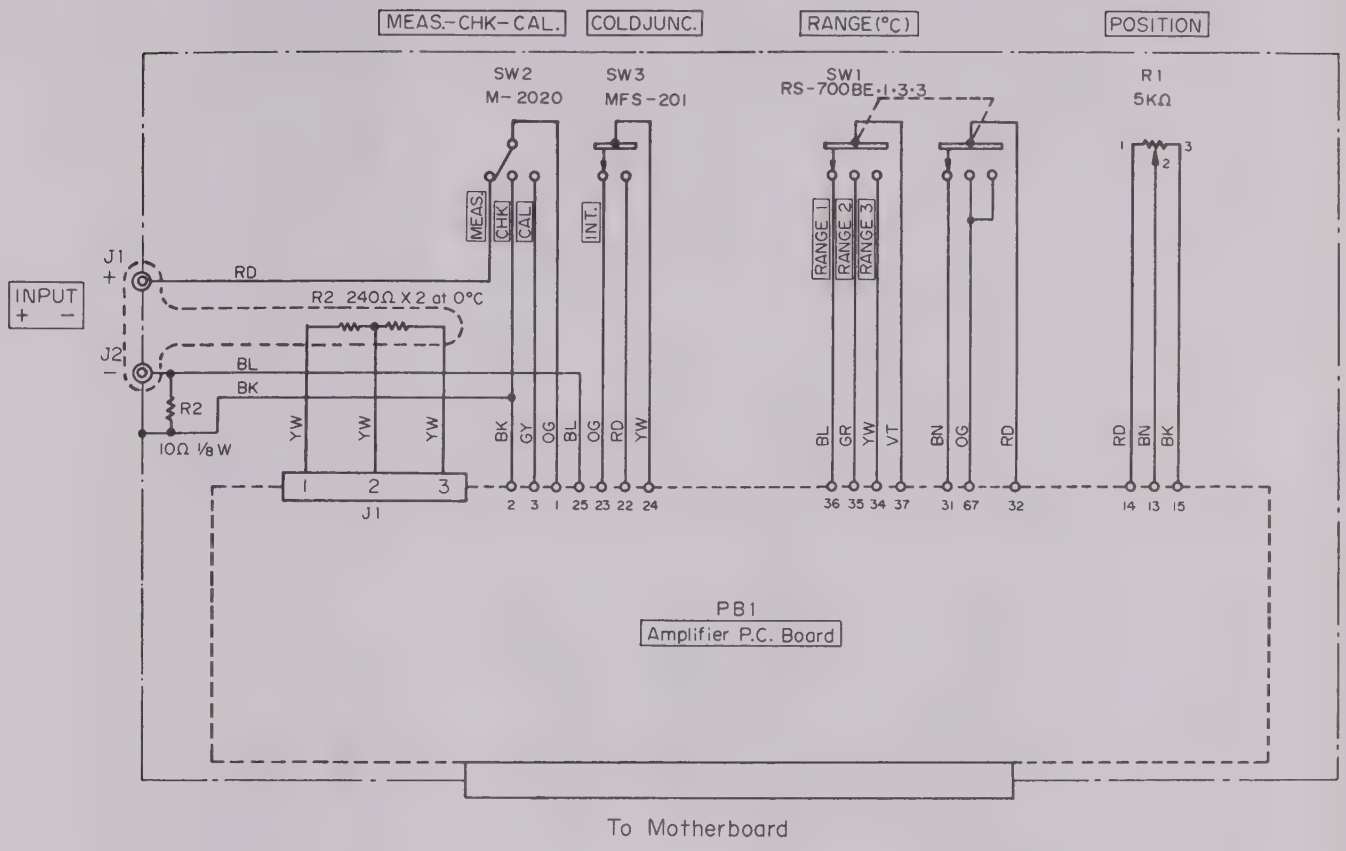
157144

REV

NOTE: 1. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157146 AND 157147 FOR DETAILS.

JU	TITLE Schematic Dia. MODULE 2, 3, 4, 5 & 6 Attenuator, 1241-3	SOLTEC® CORPORATION 157144

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



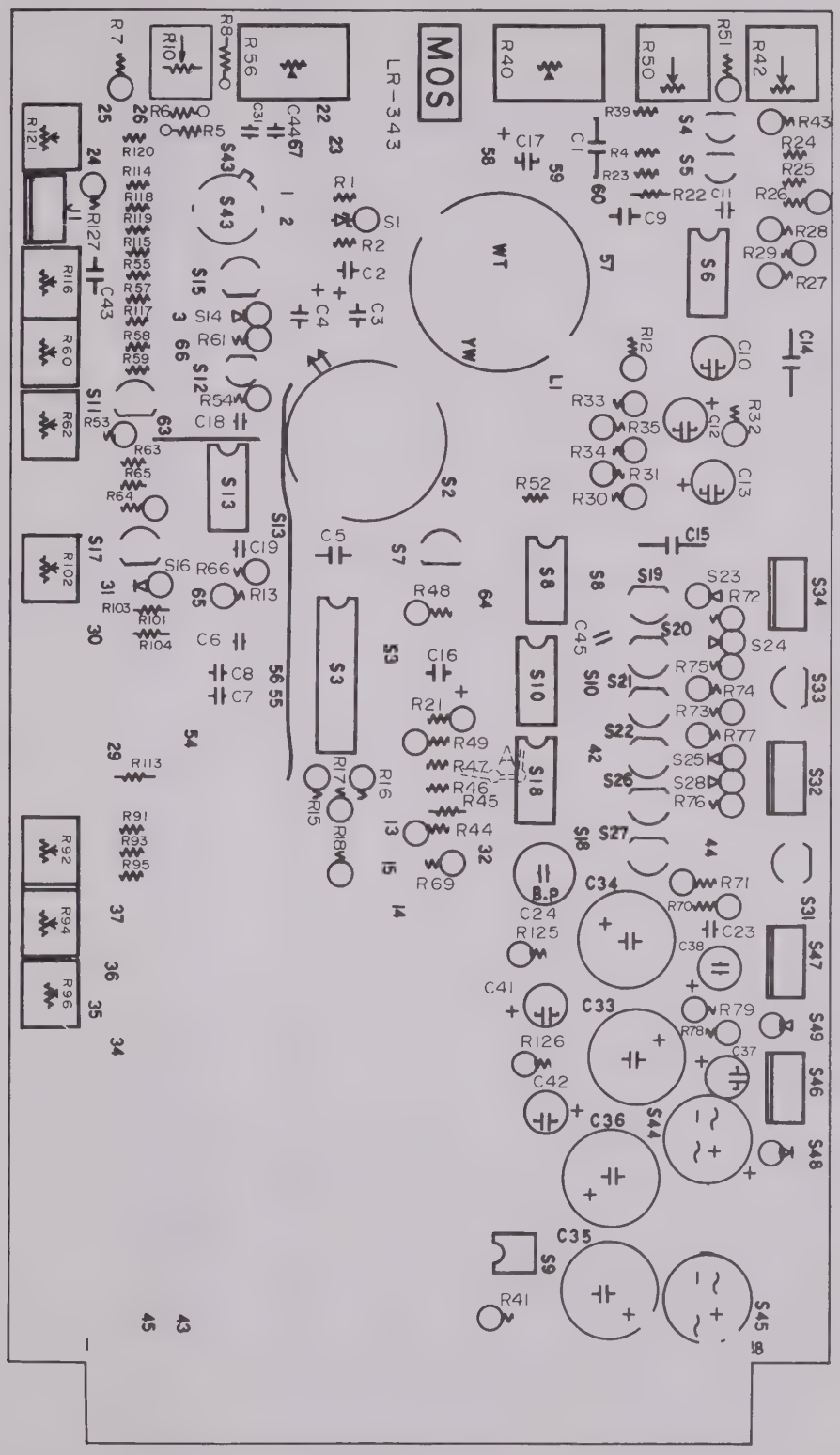
157145

REV

NOTE: 1. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157146 AND 157147 FOR DETAILS.

KU	TITLE	SOLTEC® CORPORATION
	Schematic Dia. MODULE 7 Attenuator, 1241-3	157145

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



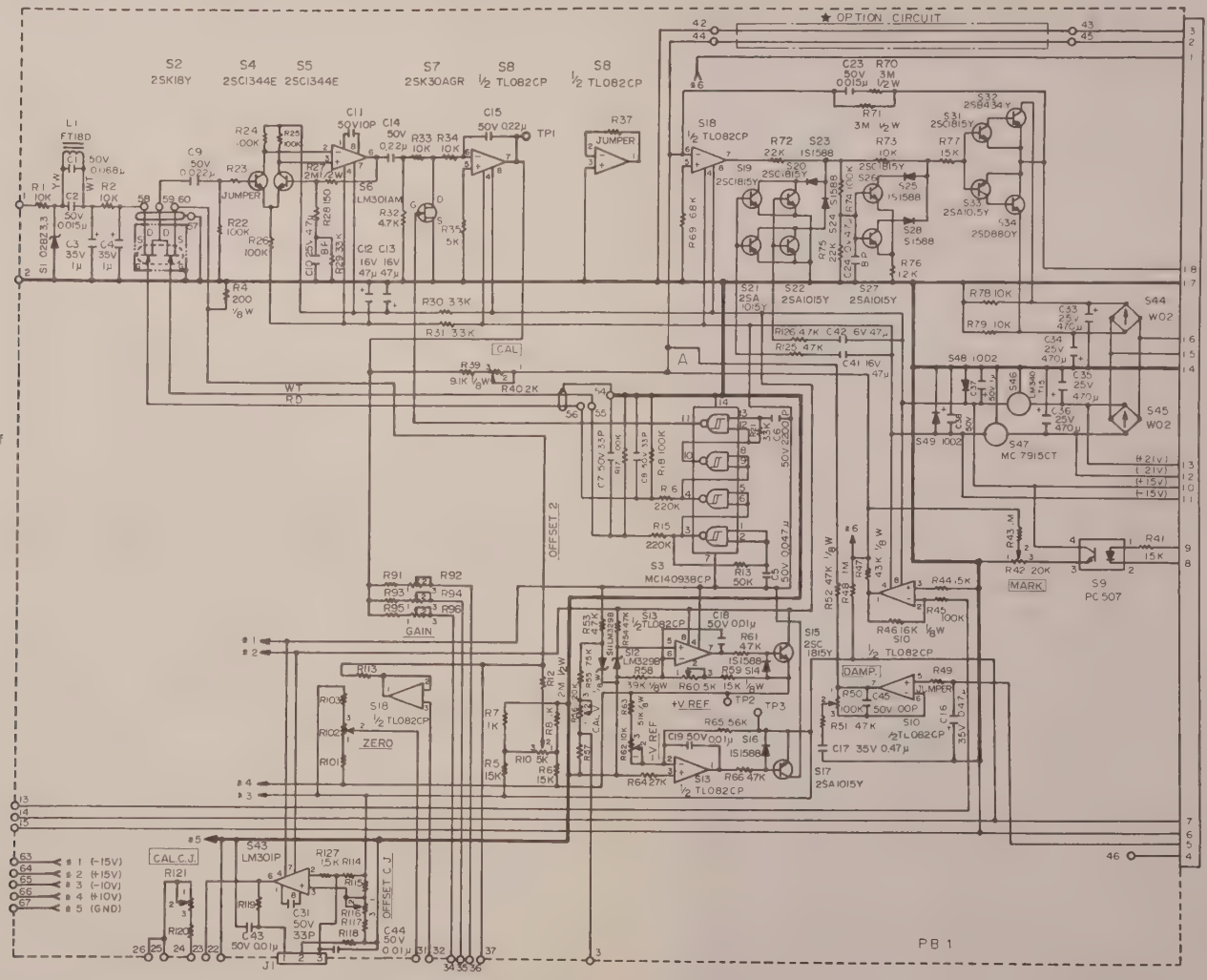
157146

REV

NOTE:
1. REFER TO SCHEMATIC NO. 157147.
2. MODULE 1 DOES NOT INCLUDE R127, C31, 43, 44, S43 AND J1.
3. WHEN INSTALLING SYNCHRONIZER TO RECORDER, JUMPER AT LAND NOS. 42–43 AND 44–45 AND OPEN AT ★A FROM THE REAR OF P.C. BOARD.

LU	TITLE Assembly MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier, 1241-3	SOLTEC CORPORATION 157146

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157147 REV

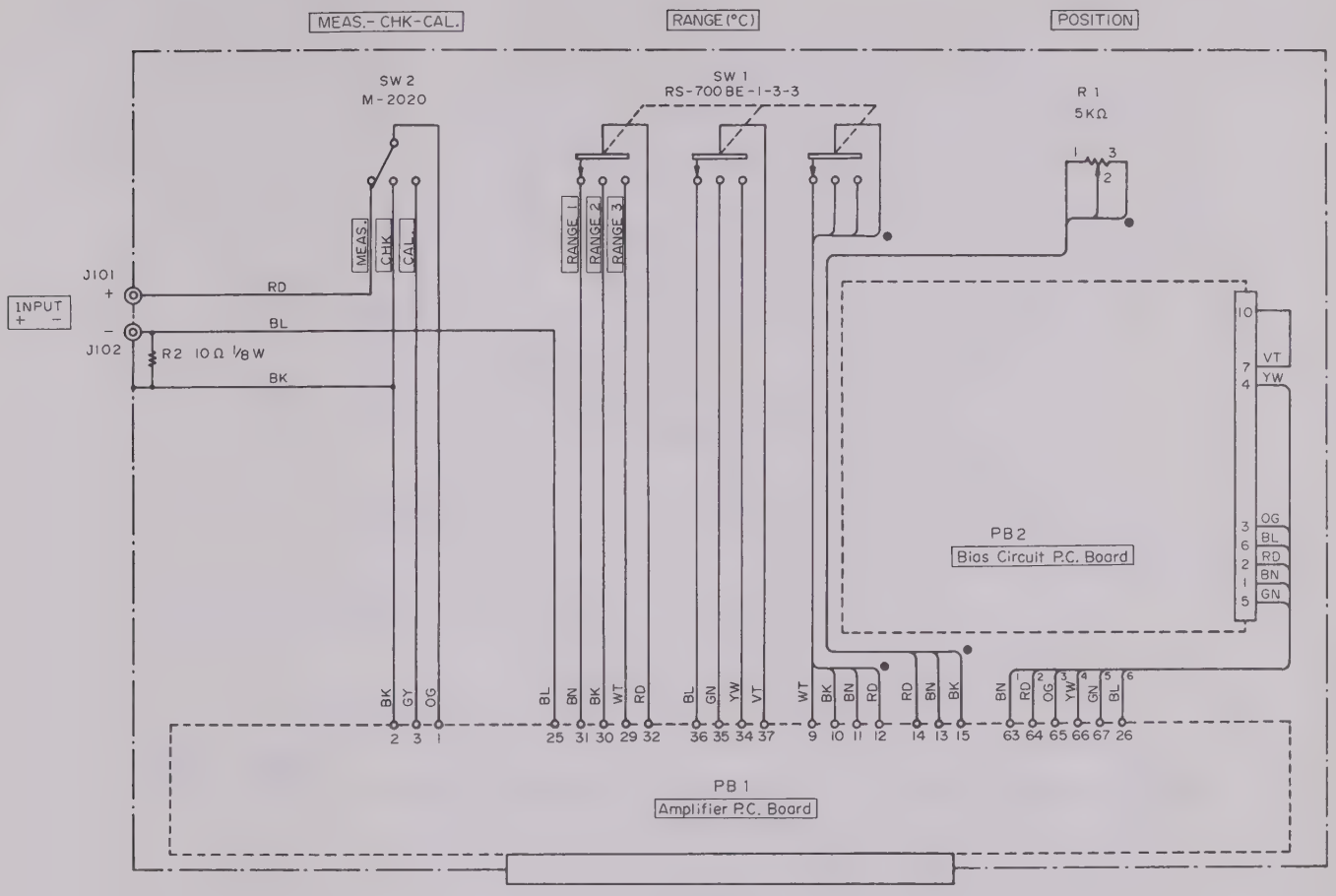
NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157146.
4. REFER TO TABLE 9.17.1 FOR R57, R91–96, R101, R102, R103, R113–R120 AND R121.
5. MODULE 1 DOES NOT NEED R127, C31, C43, C44, S43 AND J1.
6. ★OPTION CIRCUIT IS CONNECTED AND WIRING MARKED WITH A IS OPEN CIRCUITED ONLY WHEN SYNCHRONIZER IS INSTALLED.

CAUTION
MOS semiconductors are used.
Use Static Precautions.

LU	TITLE: Schematic Dia. MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier, 1241-3	SOLTEC CORPORATION 157147

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



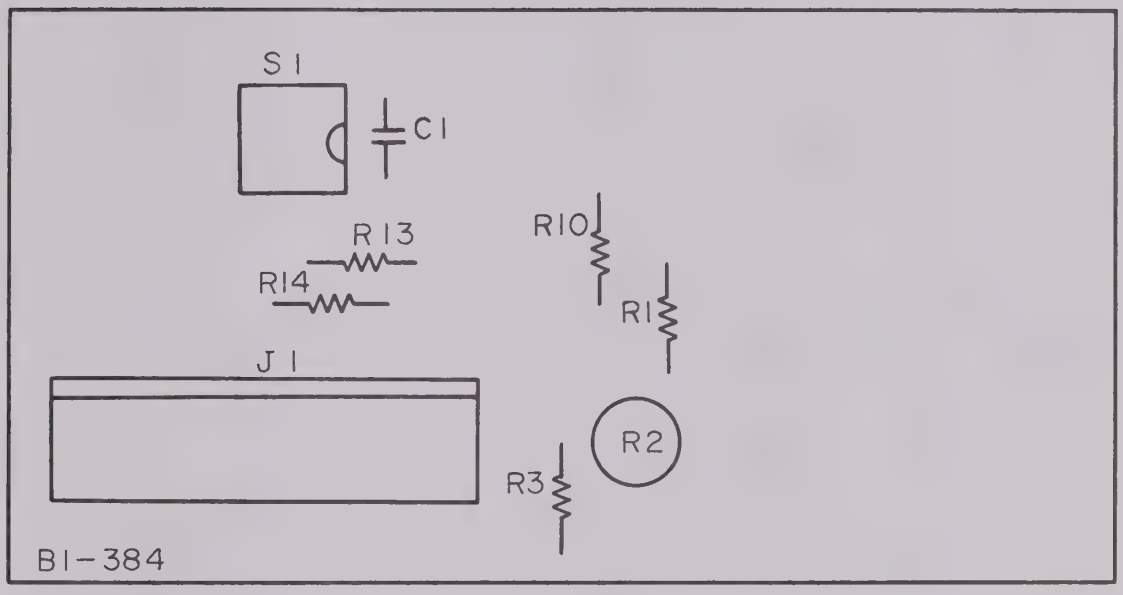
157151

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157153 FOR BIAS CIRCUIT.
2. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157155 AND 157156 FOR DETAILS.

MU	TITLE Schematic Dia. MODULE 1 (Linearized) Attenuator, 1241-3	SOLTEC® CORPORATION 157151

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



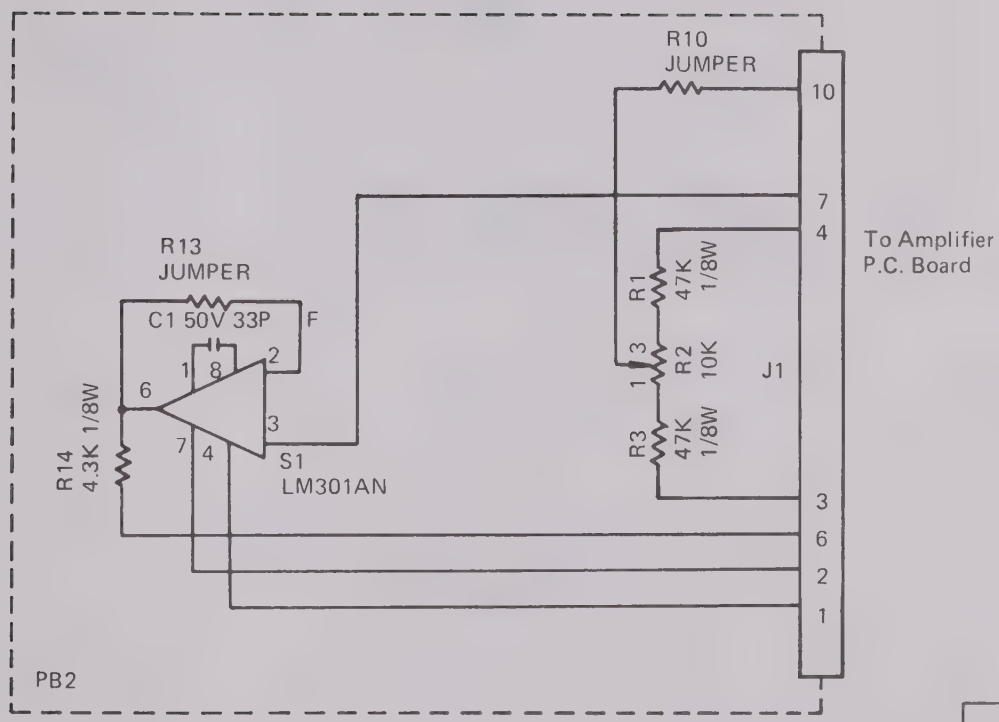
157152

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157153.

NU	TITLE Assembly MODULE 1 (Linearized) Bias Circuit, 1241-3	SOLTEC® CORPORATION 157152

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



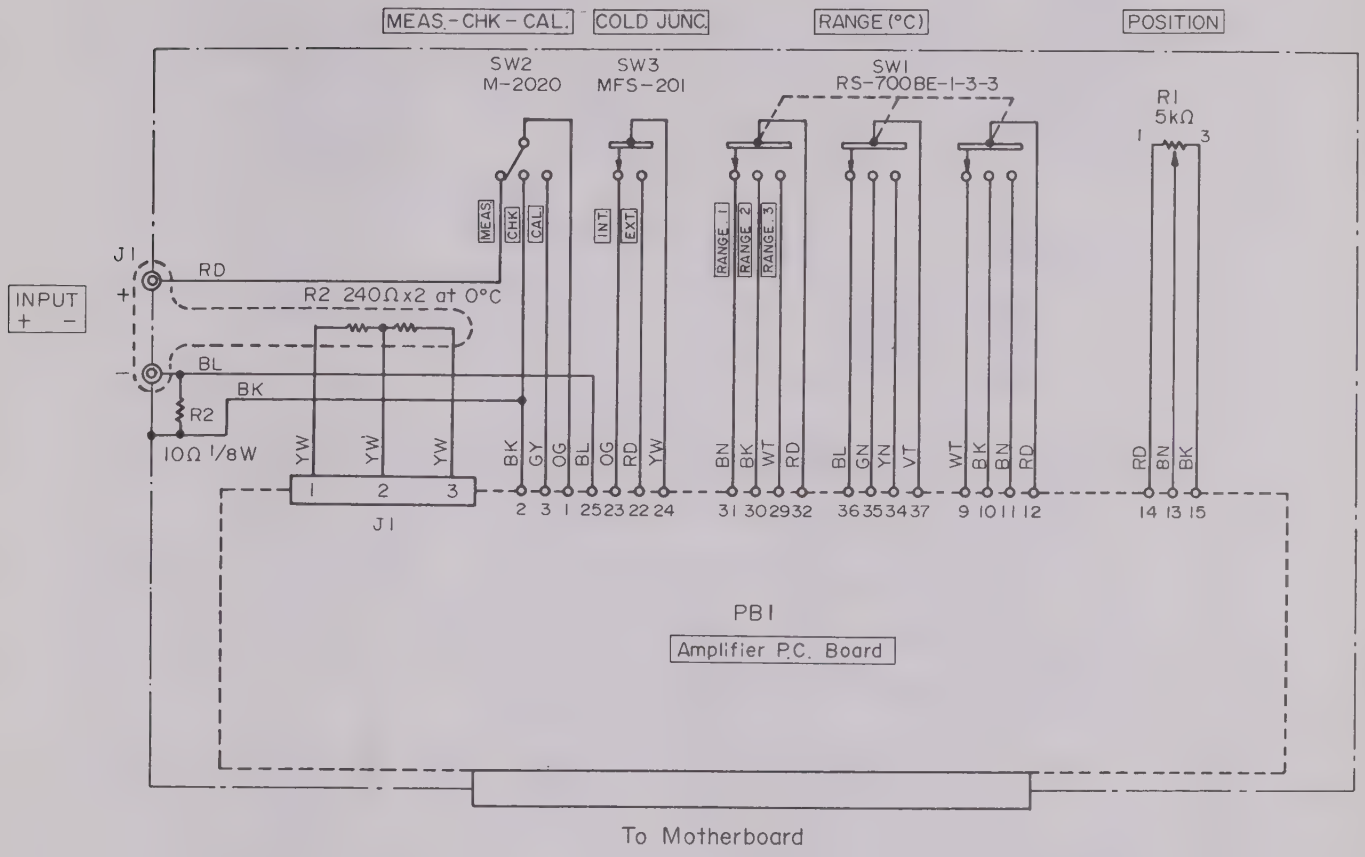
157153

REV

NOTE: REFER TO ASSEMBLY NO. 157152.

NU	TITLE Schematic Dia. MODULE 1 (Linearized) Bias Circuit, 1241-3	SOLTEC CORPORATION 157153

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



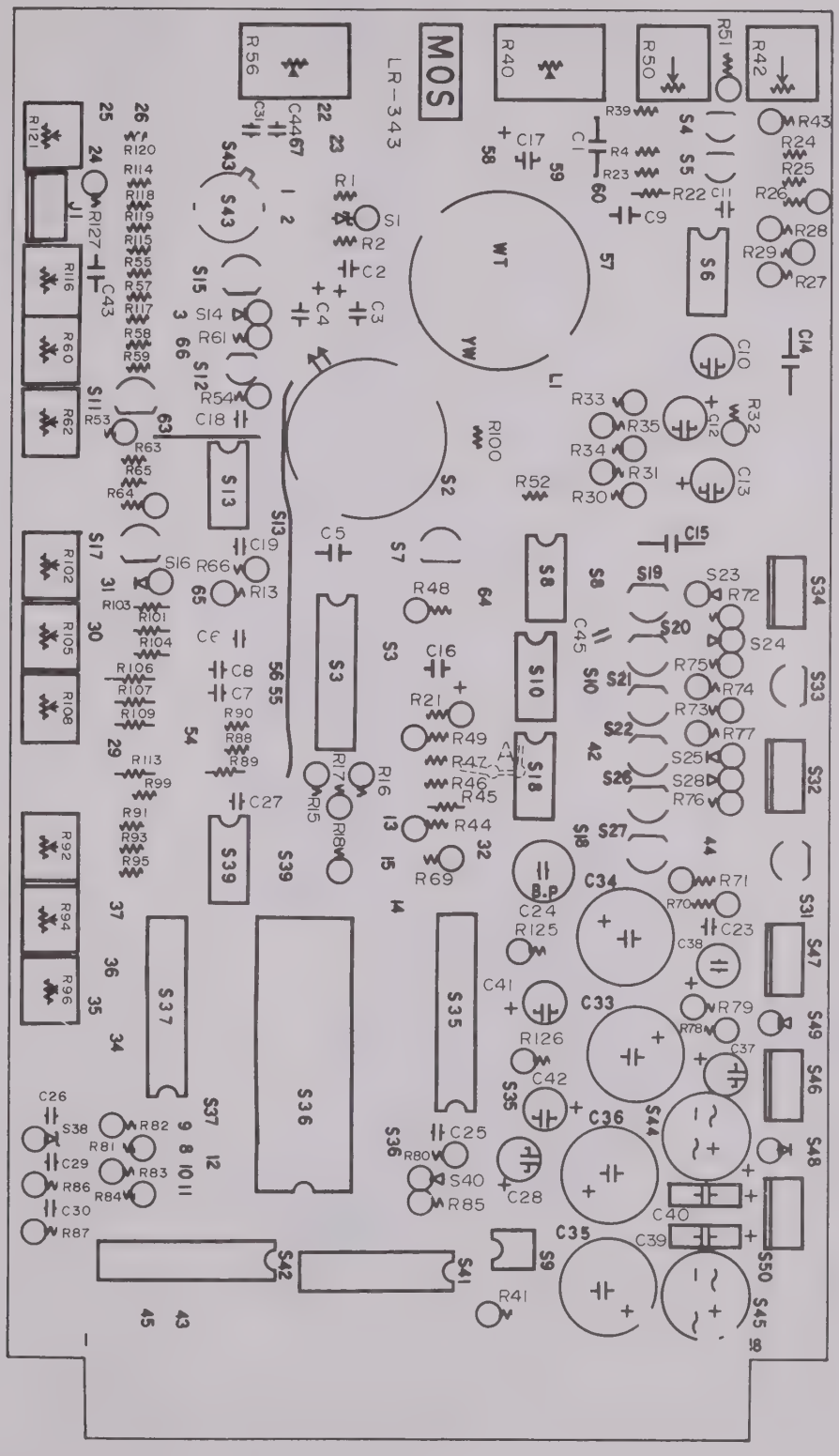
157154

REV

NOTE: 1. WHEN INSTALLING THIS MODULE TO RECORDER WITH SYNCHRONIZER, AMP. MUST BE PARTIALLY CHANGED. SEE NO. 157155 AND 157156 FOR DETAILS.

OU	TITLE Schematic Dia. MODULE 2, 3, 4, 5, 6 & 7 (Linearized) Attenuator, 1241-3	SOLTEC® CORPORATION 157154

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

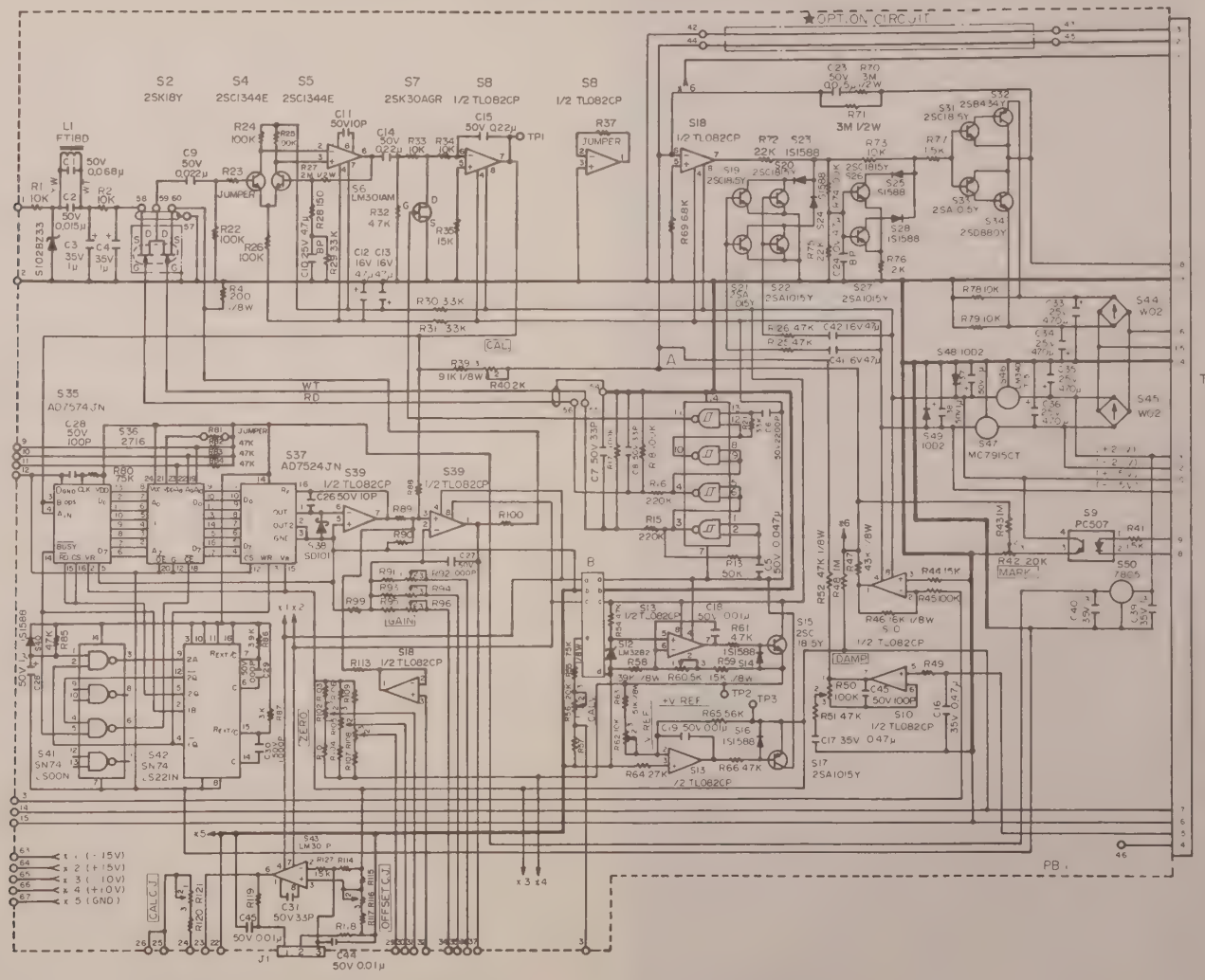


157155
REV

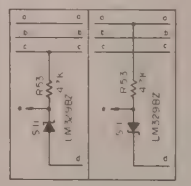
NOTE: 1. REFER TO SCHEMATIC NO. 157156.
2. MODULE 1 DOES NOT INCLUDE R127, C31, 43, 44, S43 AND J1.
3. WHEN INSTALLING SYNCHRONIZER TO RECORDER, JUMPER AT LAND NOS. 42–43 AND 44–45 AND OPEN AT ★A FROM THE REAR OF P.C. BOARD.

PU	TITLE Assembly MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier	SOLTEC® CORPORATION 157155

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



B: Wiring of the blank box



157156 REV

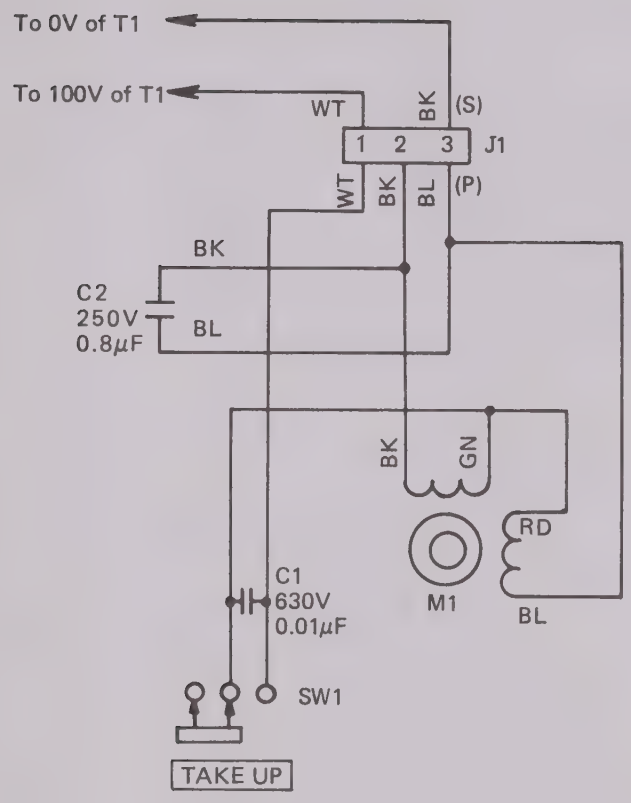
NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157155.
4. REFER TO TABLE 9.21.1 FOR R57, R88–96, R99–109, R113–120 AND R121.
5. MODULE 1 DOES NOT NEED R127, C31, C43, C44, S43 AND J1.
6. ★OPTION CIRCUIT IS CONNECTED AND WIRING MARKED WITH A IS OPEN CIRCUITED ONLY WHEN SYNCHRONIZER IS INSTALLED.

CAUTION
MOS semiconductors are used.
Use Static Precautions.

PU	TITLE	Schematic Dia. MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier, 1241-3	SOLTEC® CORPORATION 157156

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

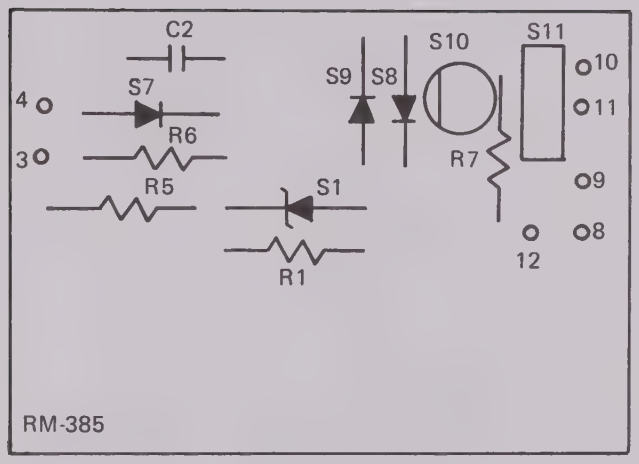


157201

REV

A0	TITLE Schematic Dia. OPTION 1 Chart Take-up, 1241-3	SOLTEC® CORPORATION	157201

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

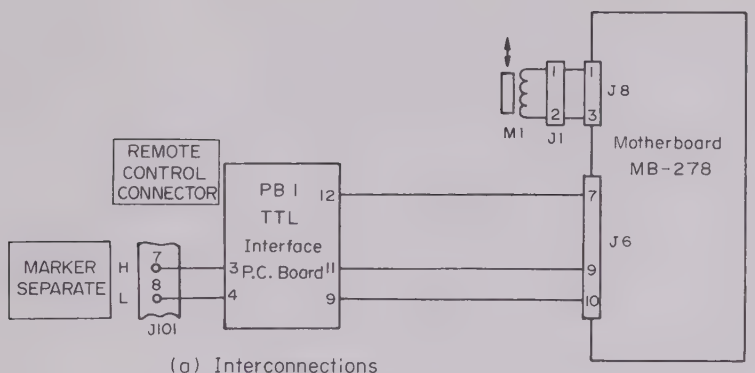


157211
REV

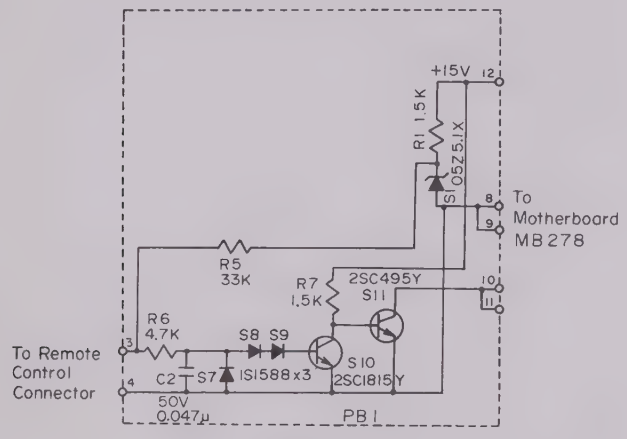
NOTE: 1. REFER TO SCHEMATICS NO. 157212 (b) AND 157213 (b).

BO1 BO2	TITLE Assembly OPTION 2 Event Marker, TTL Interface, 1241-2	SOLTEC® CORPORATION 157211

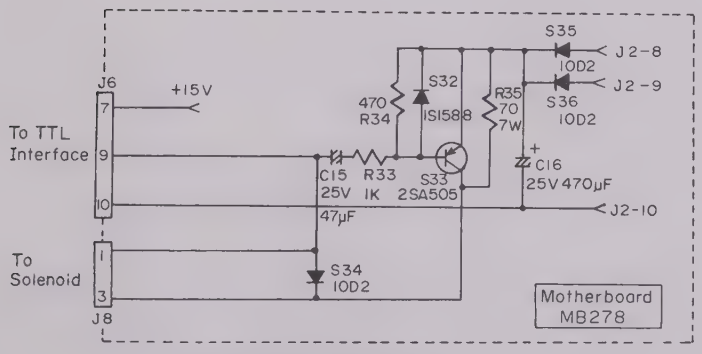
REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



(a) Interconnections



(b) TTL Interface



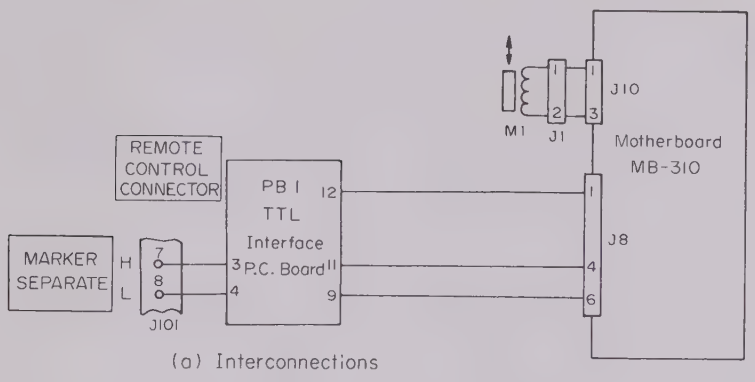
(c) Motherboard Additional Circuit

157212
REV

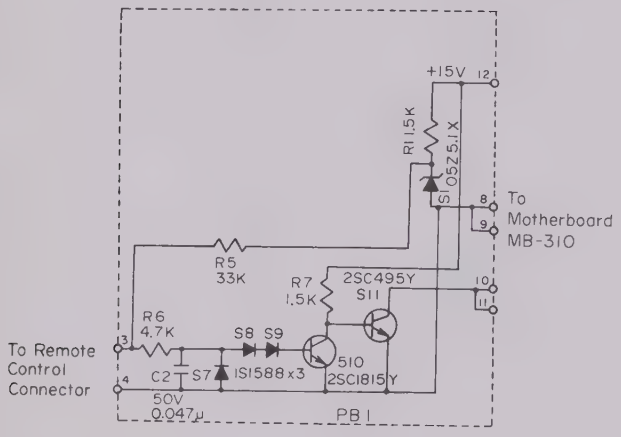
NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157211 FOR TTL INTERFACE.

B01	TITLE Schematic Dia. OPTION 2 Event Marker, 1241-2	SOLTEC® CORPORATION 157212

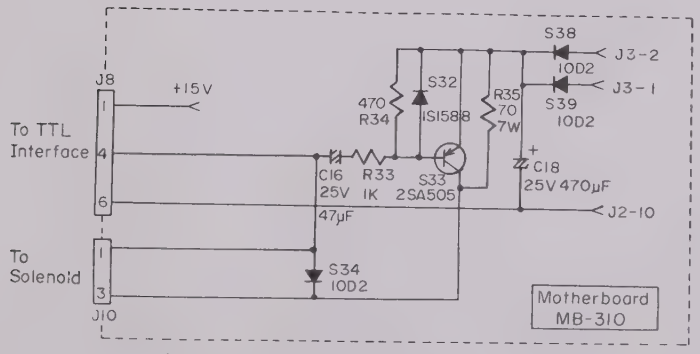
REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



(a) Interconnections



(b) TTL Interface



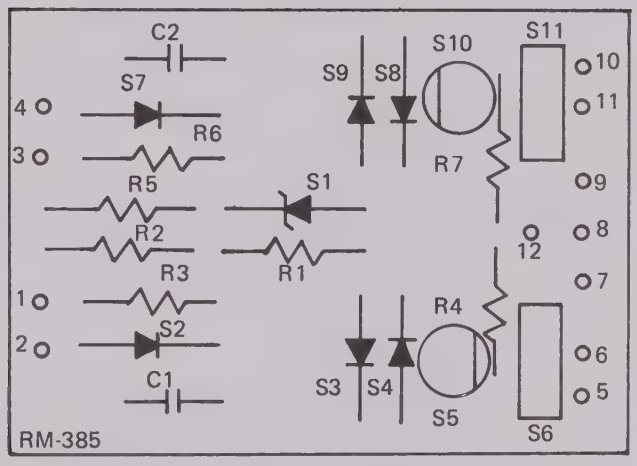
(c) Motherboard Additional Circuit

157213
REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157211 FOR TTL INTERFACE.

B02	TITLE Schematic Dia. OPTION 2 Event Marker, 1243	SOLTEC® CORPORATION 157213

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



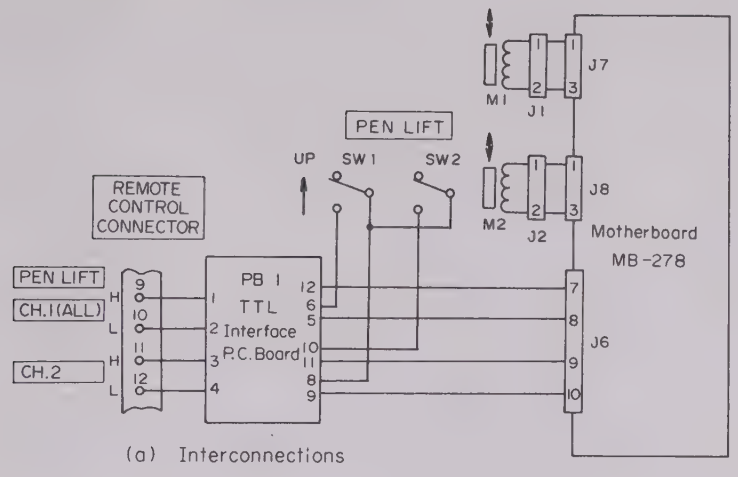
157221

REV

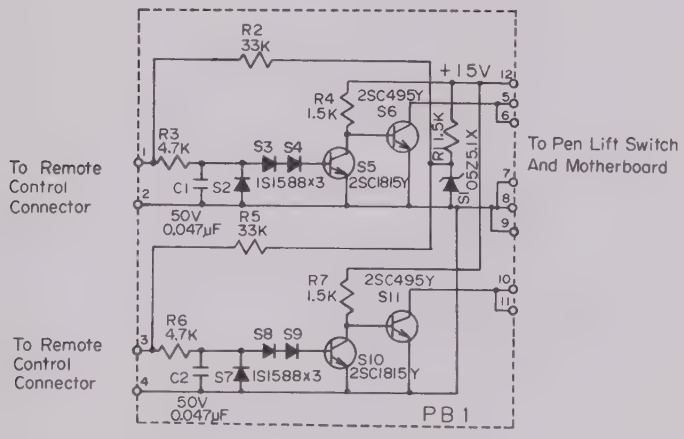
NOTE: 1. REFER TO SCHEMATIC NO. 157222 (b).

CO	TITLE Assembly OPTION 3 Electric Pen Lift, TTL Interface, 1241-2	SOLTEC® CORPORATION 157221

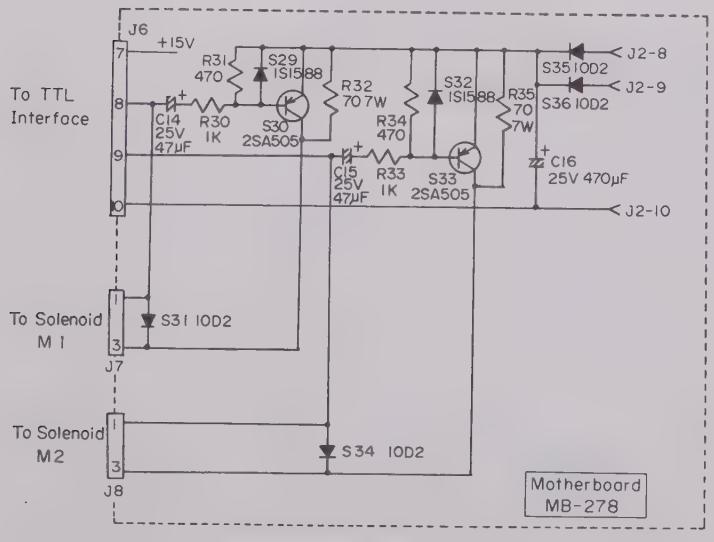
REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



(a) Interconnections



(b) TTL Interface



(c) Motherboard Additional Circuit

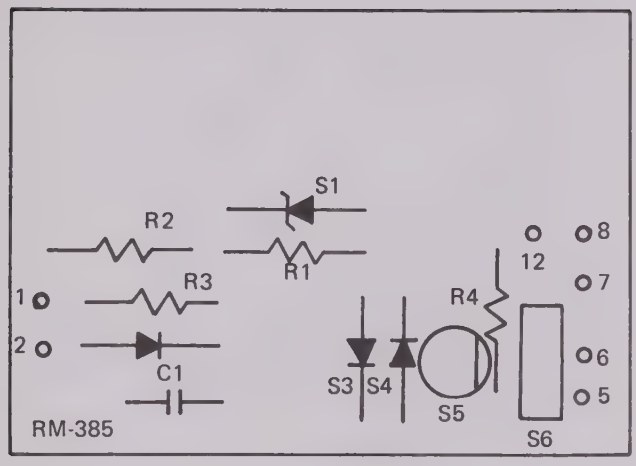
157222

REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157221.

CO	TITLE	SOLTEC CORPORATION
	Schematic Dia. OPTION 3 Electric Pen Lift, 1241-2	157222

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



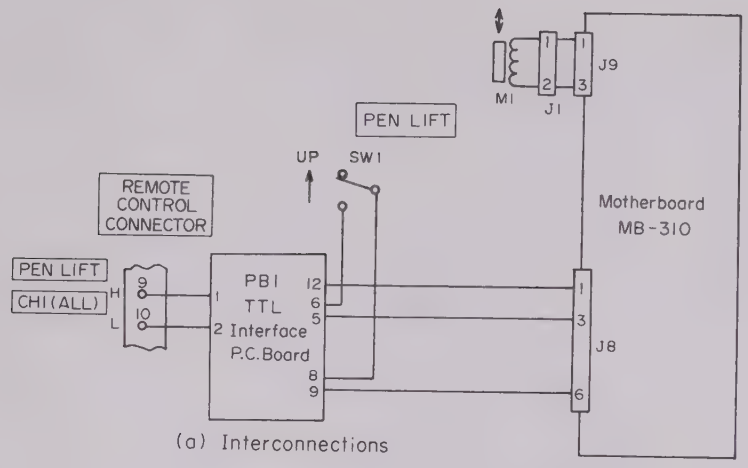
157223

REV

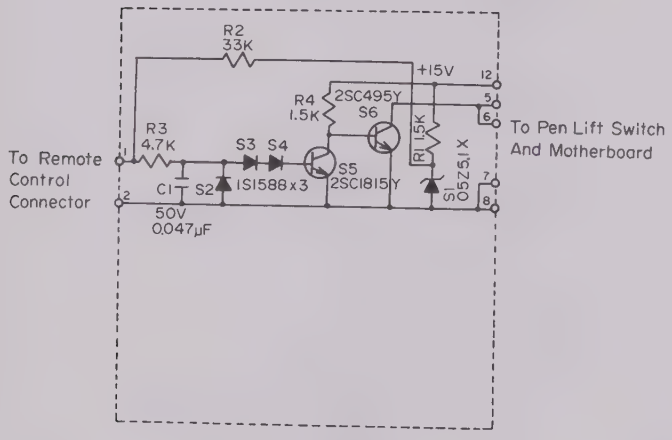
NOTE: 1. REFER TO SCHEMATIC NO. 157224 (b).

DO	TITLE Assembly OPTION 4 Electric Pen Lift, TTL Interface, 1243	SOLTEC® CORPORATION 157223

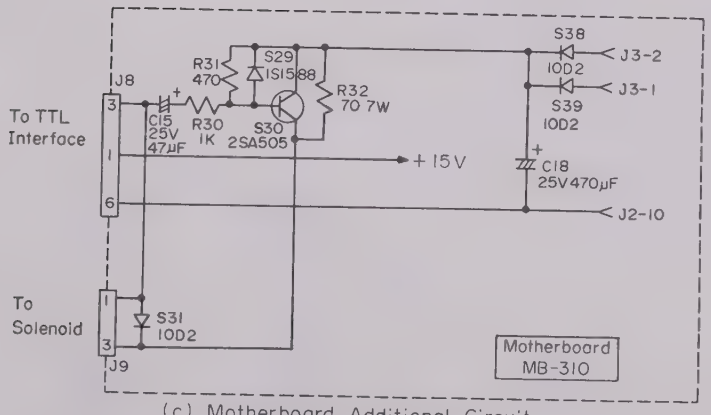
REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



(a) Interconnections



(b) TTL Interface



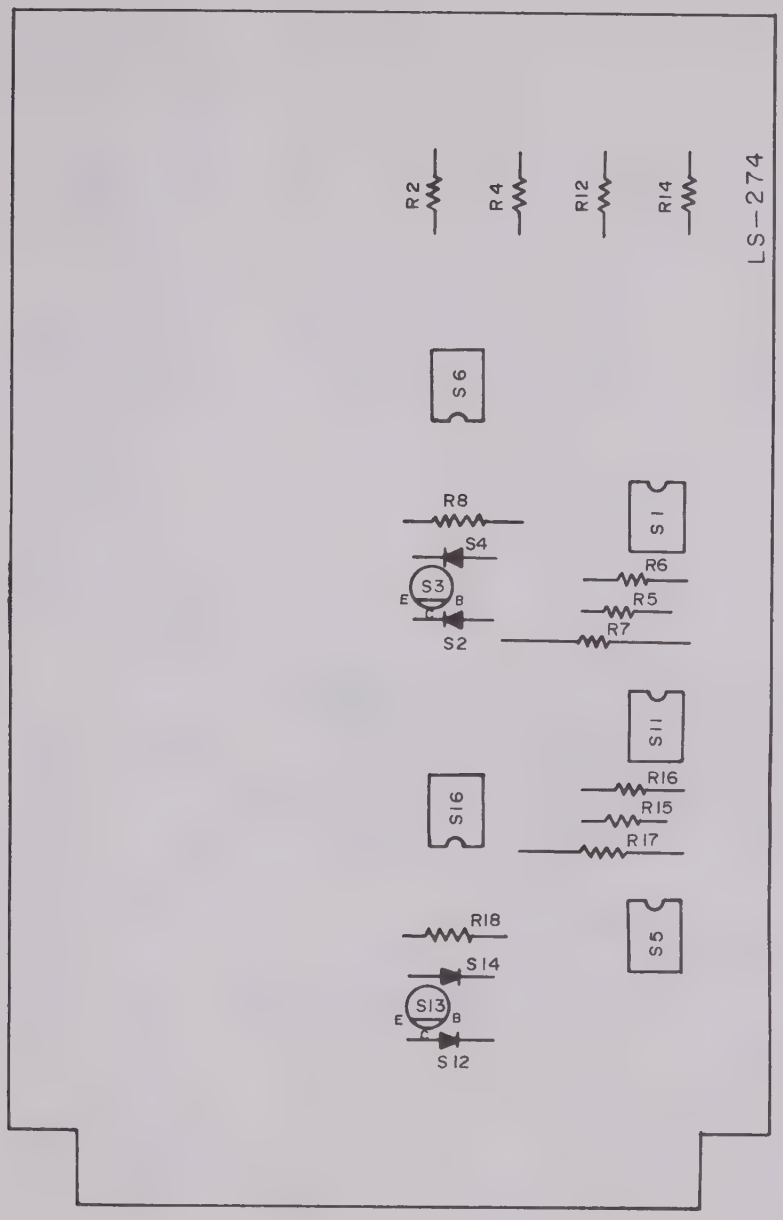
(c) Motherboard Additional Circuit

157224
REV

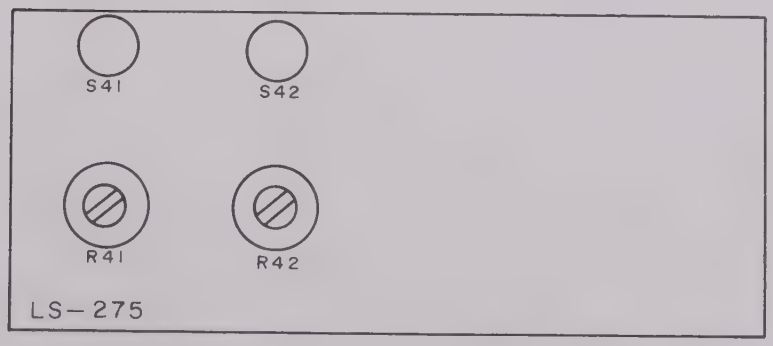
NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157223.

DO	TITLE	SOLTEC® CORPORATION
	Schematic Dia. OPTION 4 Electric Pen Lift, 1243	157224

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



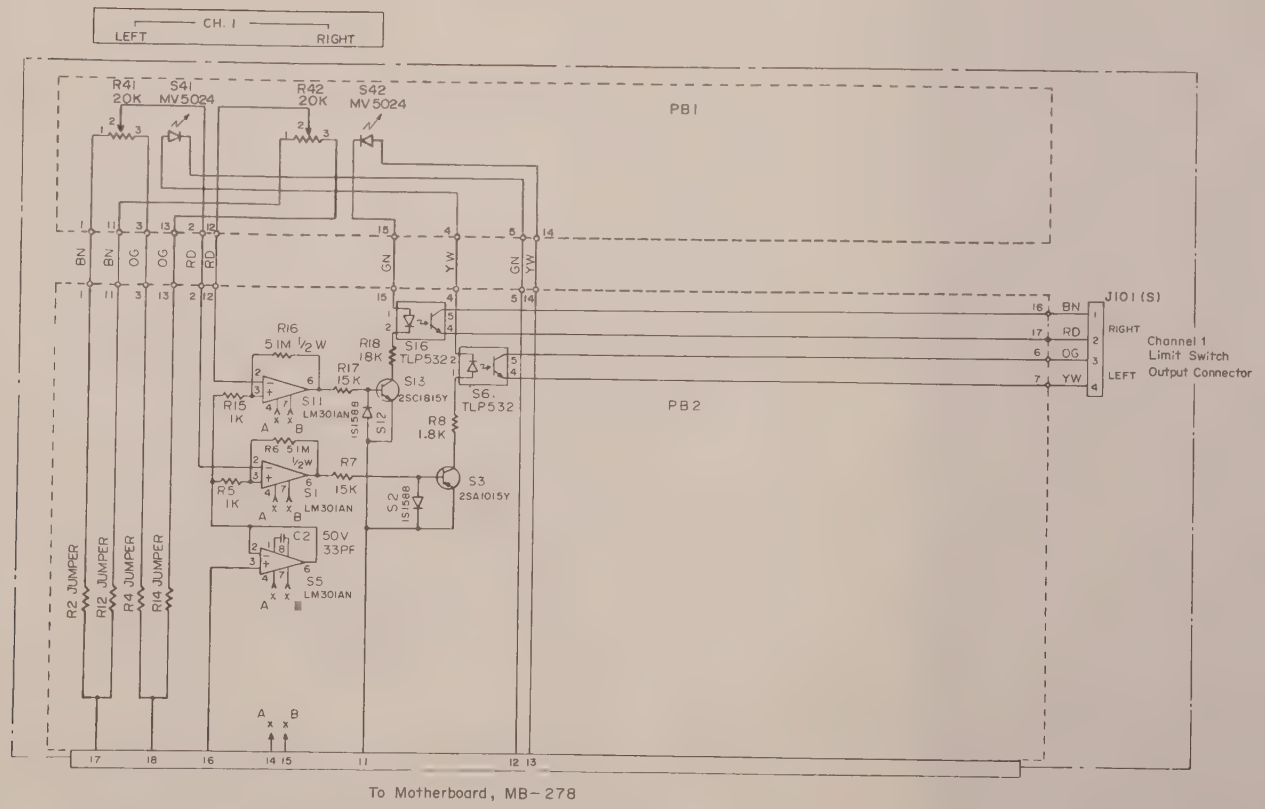
157231
REV



NOTE: 1. REFER TO SCHEMATIC NO. 157232 (a).

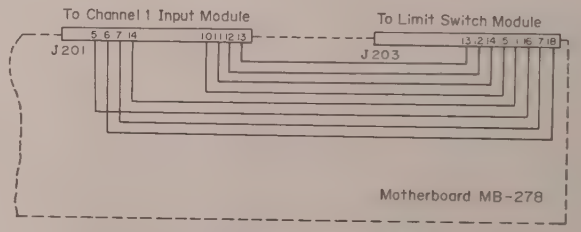
EO	TITLE Assembly OPTION 5 Electronic Limit Switch, 1241	SOLTEC® CORPORATION 157231

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



To Motherboard, MB-278

(a) Electronic Limit Switch Circuit, 1241



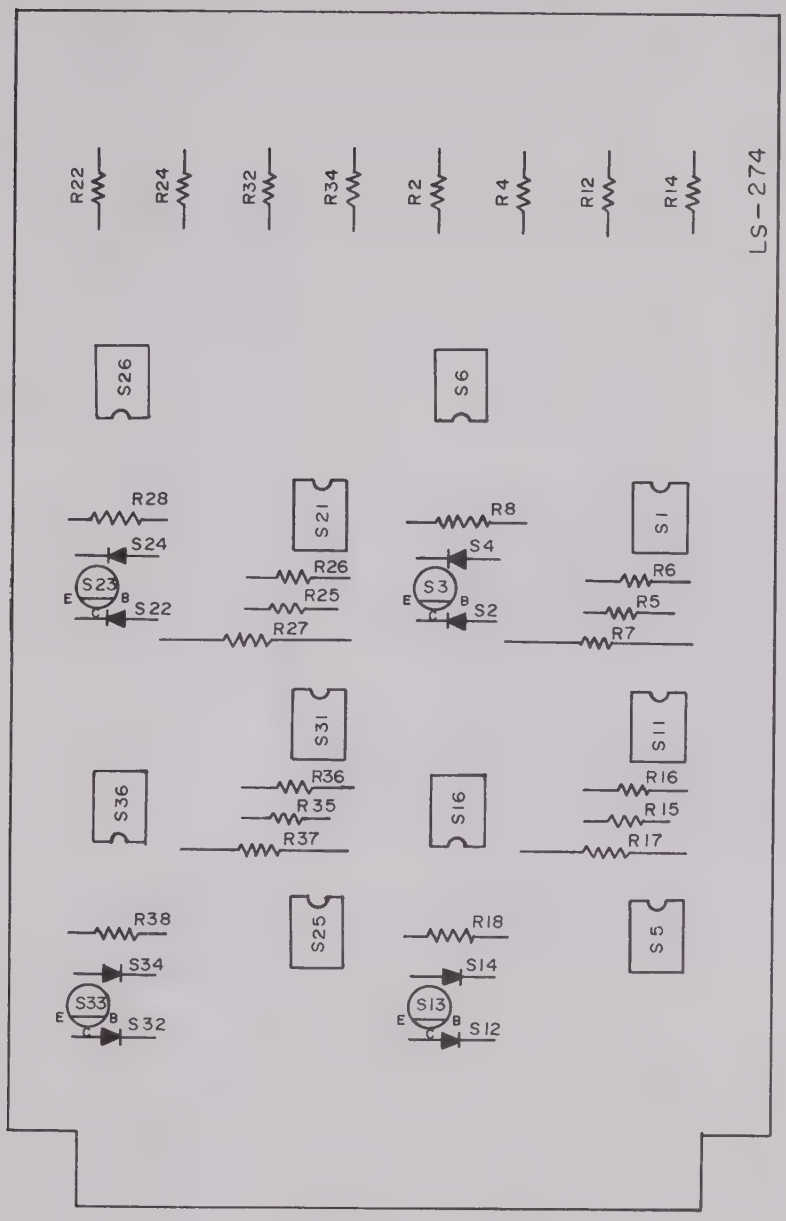
(b) Motherboard Additional Circuit, 1241

157232 REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157231.

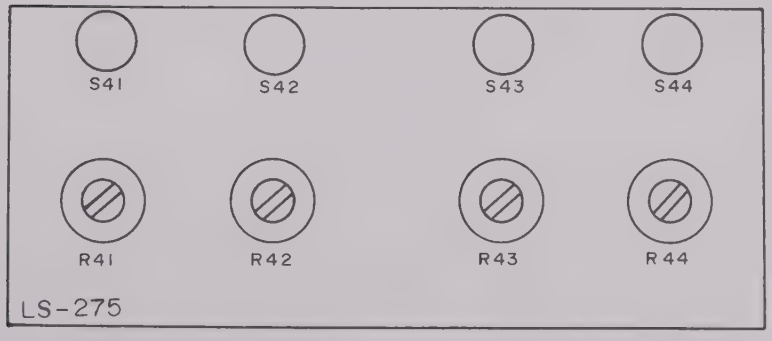
EO	TITLE	SOLTEC CORPORATION
	Schematic Dia. OPTION 5 Electronic Limit Switch, 1241	157232

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157233

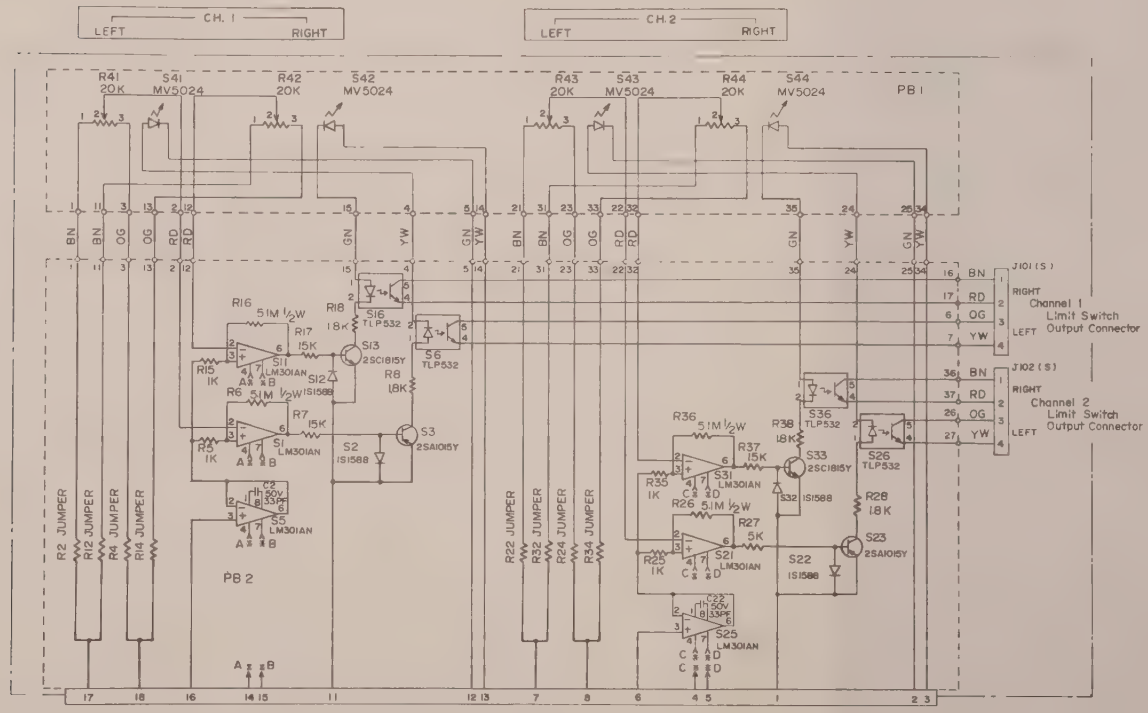
REV



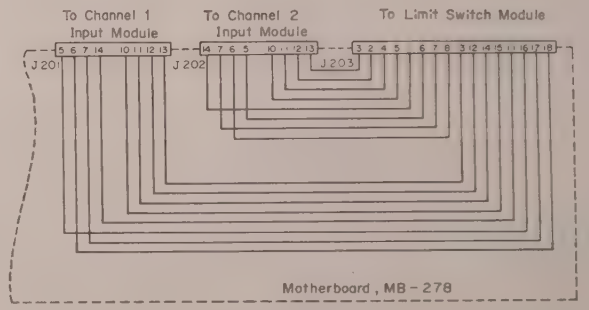
NOTE: 1. REFER TO SCHEMATIC NO. 157234 (a).

FO	TITLE Assembly OPTION 6 Electronic Limit Switch, 1242	SOLTEC CORPORATION 157233

REVISIONS				
SYM	DESCRIPTION	DATE	CHK'D	APPR



(a) Electronic Limit Switch Circuit, 1242



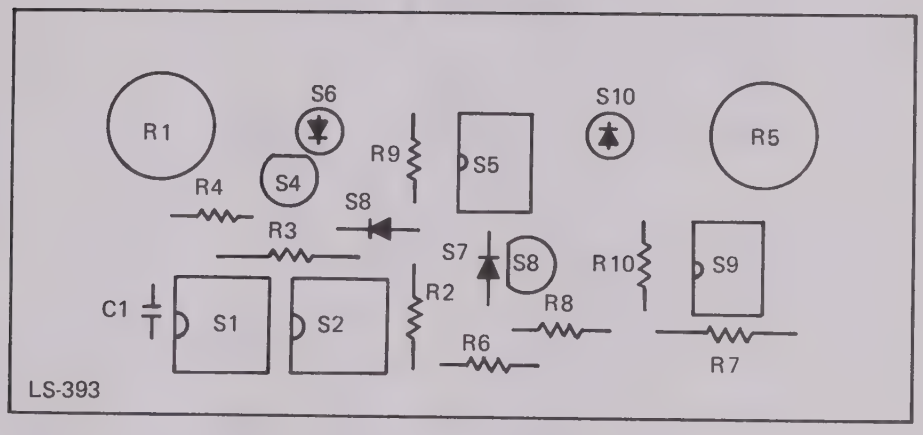
(b) Motherboard Additional Circuit, 1242

157234 REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. REFER TO ASSEMBLY NO. 157233.

FO	TITLE	SOLTEC CORPORATION
	Schematic Diag. OPTION 6 Electronic Limit Switch, 1242	157234

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



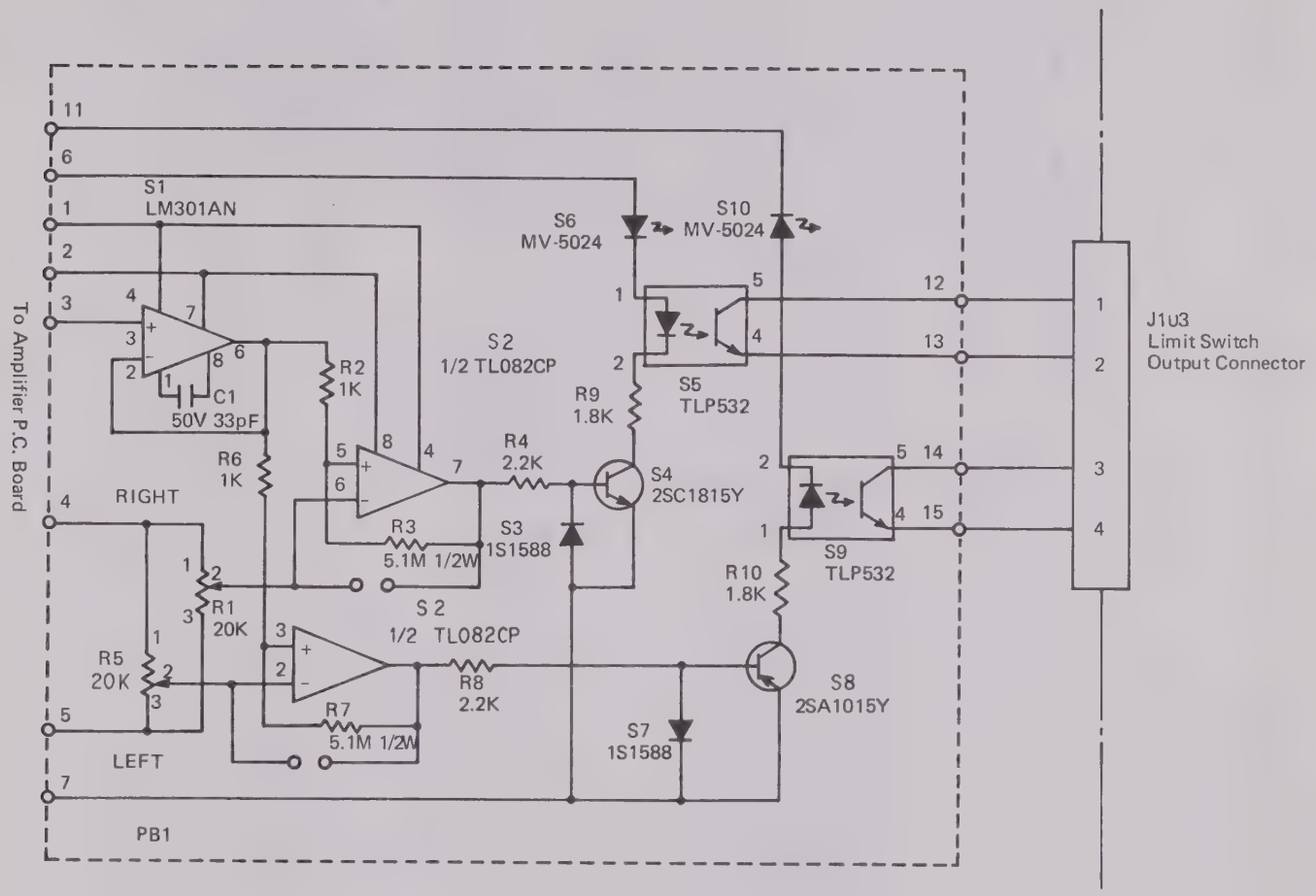
157235

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157236.

GO	TITLE Assembly OPTION 7 Electronic Limit Switch, 1243	SOLTEC® CORPORATION 157235

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157236

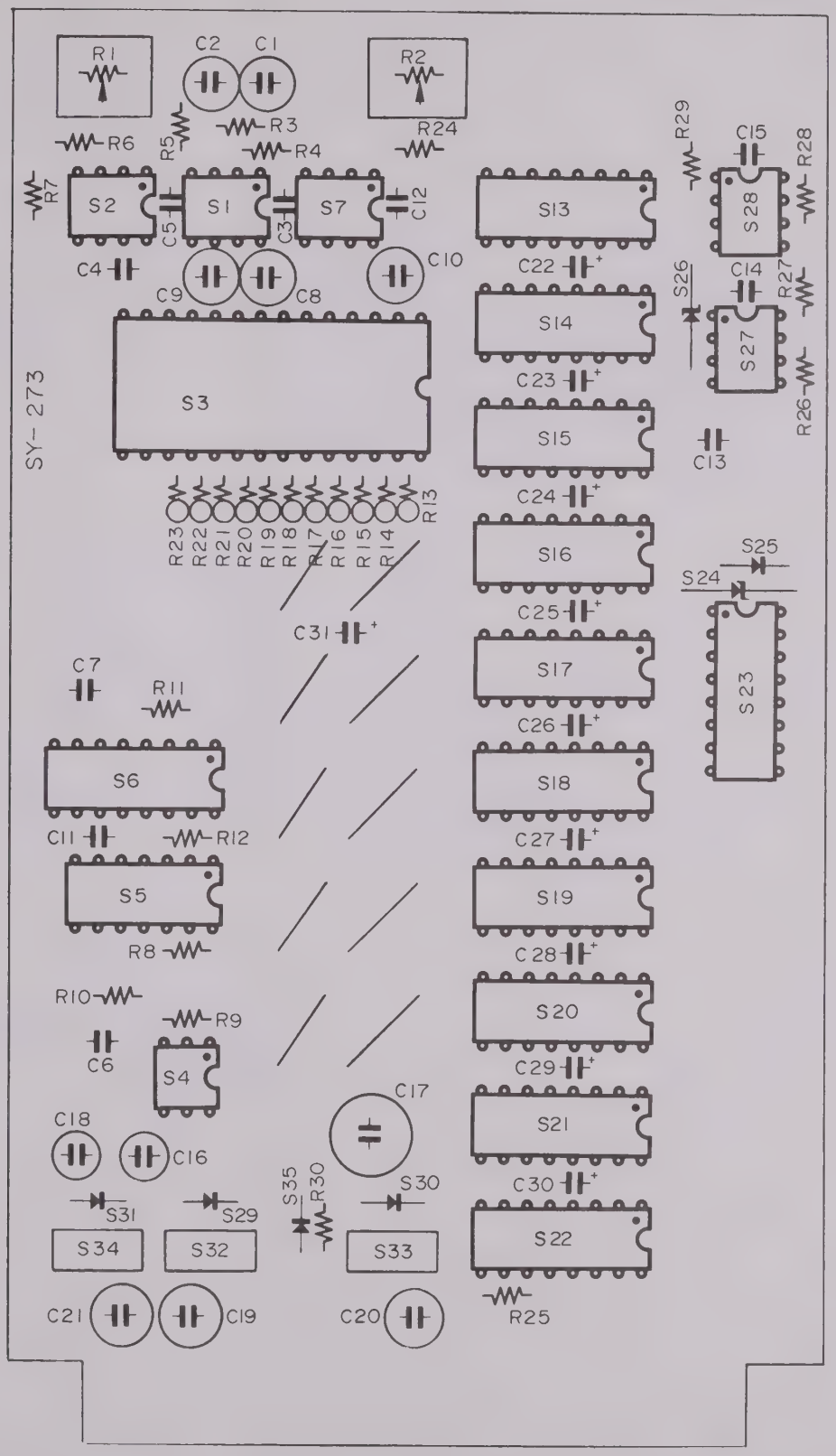
REV

NOTE: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. THIS CIRCUIT INCLUDED INTO THE INPUT MODULE FOR THE 3 PEN RECORDER.
3. REFER TO ASSEMBLY NO. 157235.

GO	TITLE	SOLTEC® CORPORATION
	Schematic Dia. OPTION 7 Electronic Limit Switch, 1243	157236

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

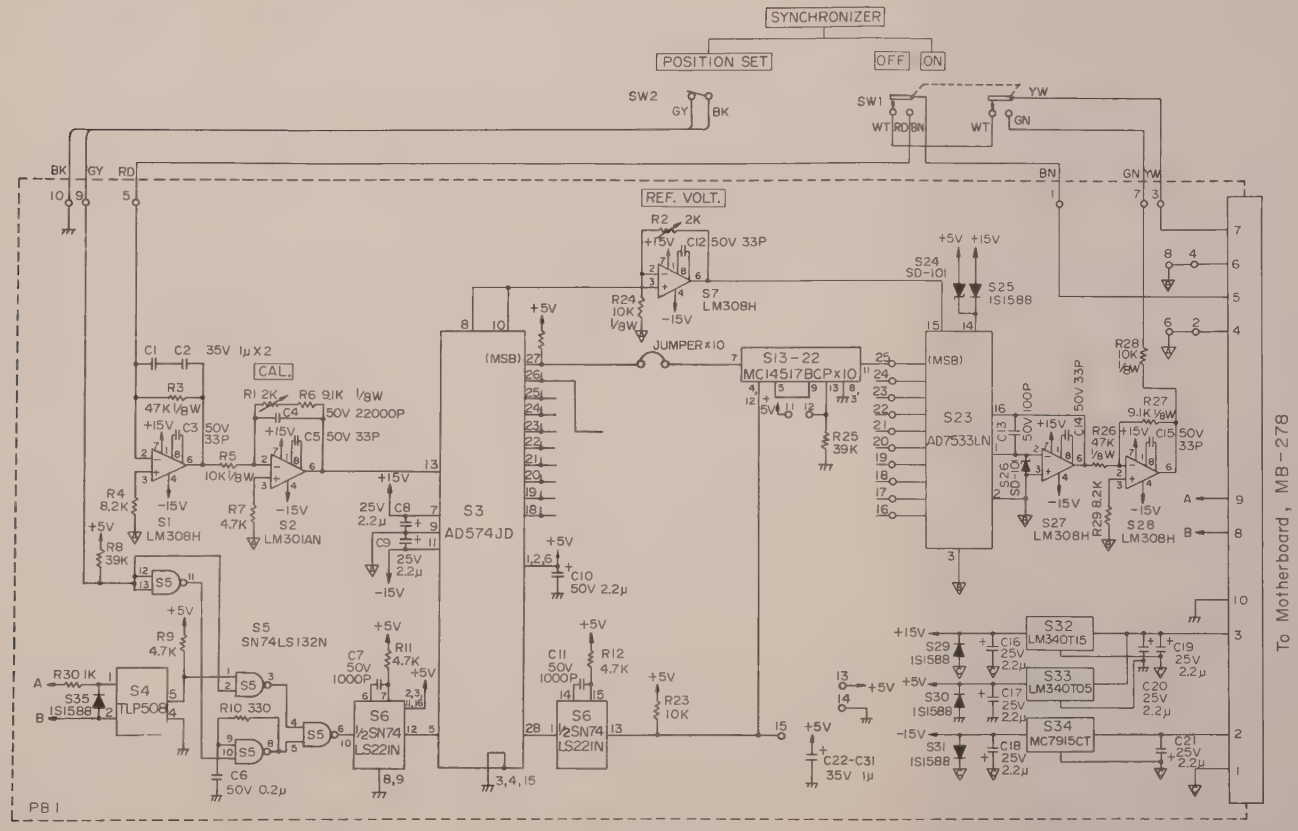


157241 REV

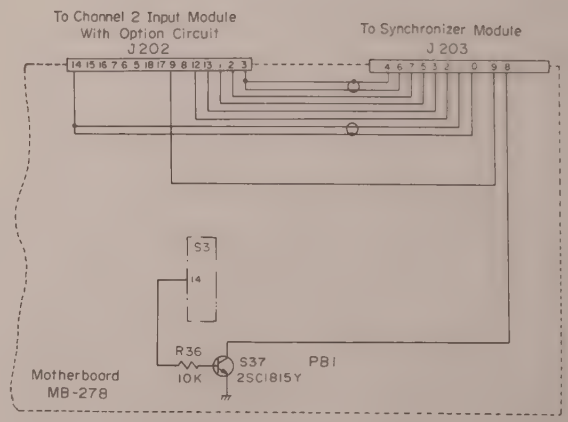
NOTE: 1. REFER TO SCHEMATIC NO. 157242 (a).

HO	TITLE: Assembly OPTION 10 Synchronizer, 1242	SOLTEC® CORPORATION 157241

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



(a) Synchronizer Circuit, 1242



(b) Motherboard Additional Circuit, 1242

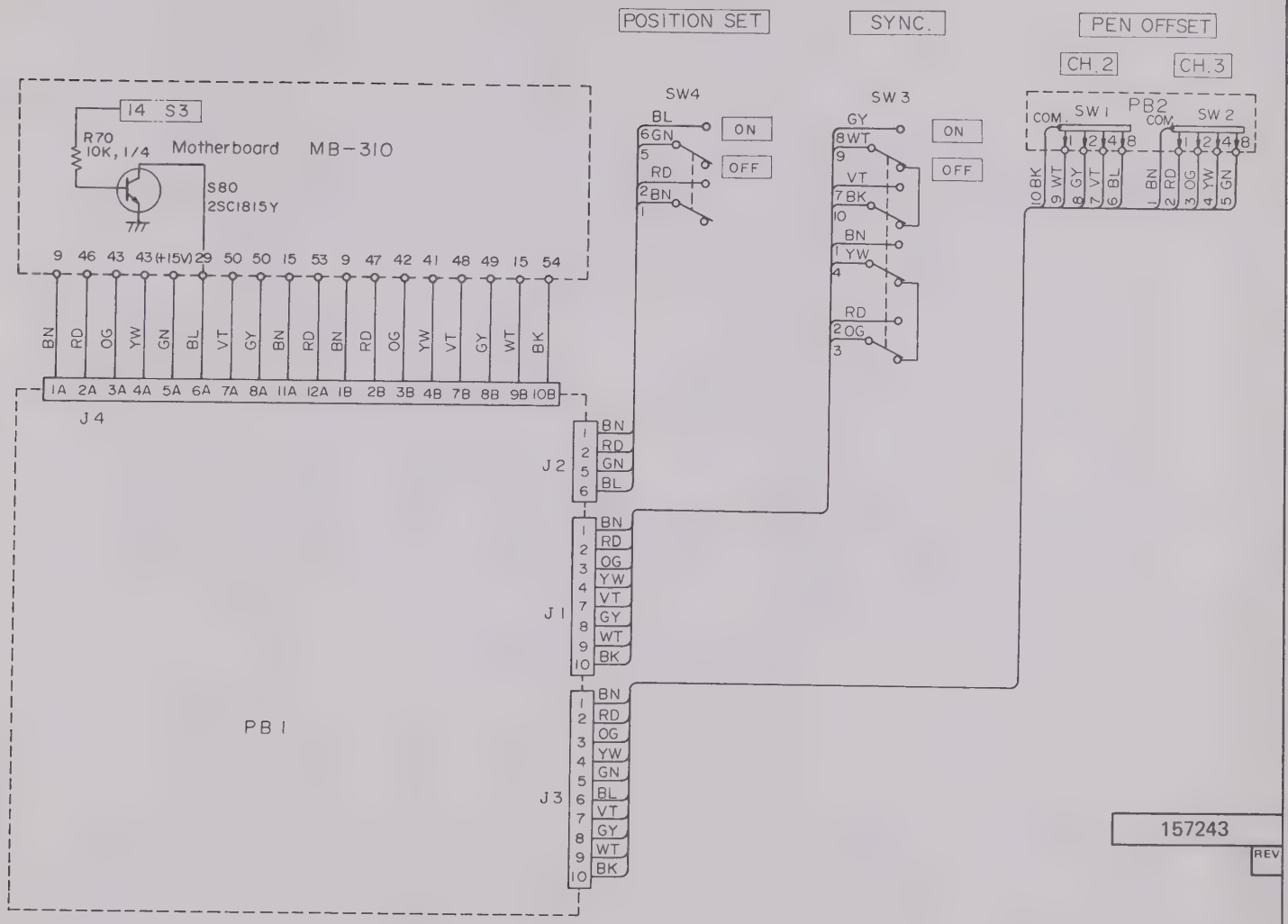
157242 REV

NOTE: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157241.
4. EACH PORTION HAVING MARK ▽ , ▽ OR ▽ IS CONNECTED, AS EACH GROUP, TO A CONNECTOR AND GROUNDED INSIDE THE MOTHERBOARD.
5. C22–C31 ARE GROUNDED BY RESPECTIVE IC PINS.

CAUTION
MOS semiconductors are used.
Use Static Precautions.

HO	TITLE	SOLTEC CORPORATION
	Schematic Dia. OPTION 10 Synchronizer, 1242	157242

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR

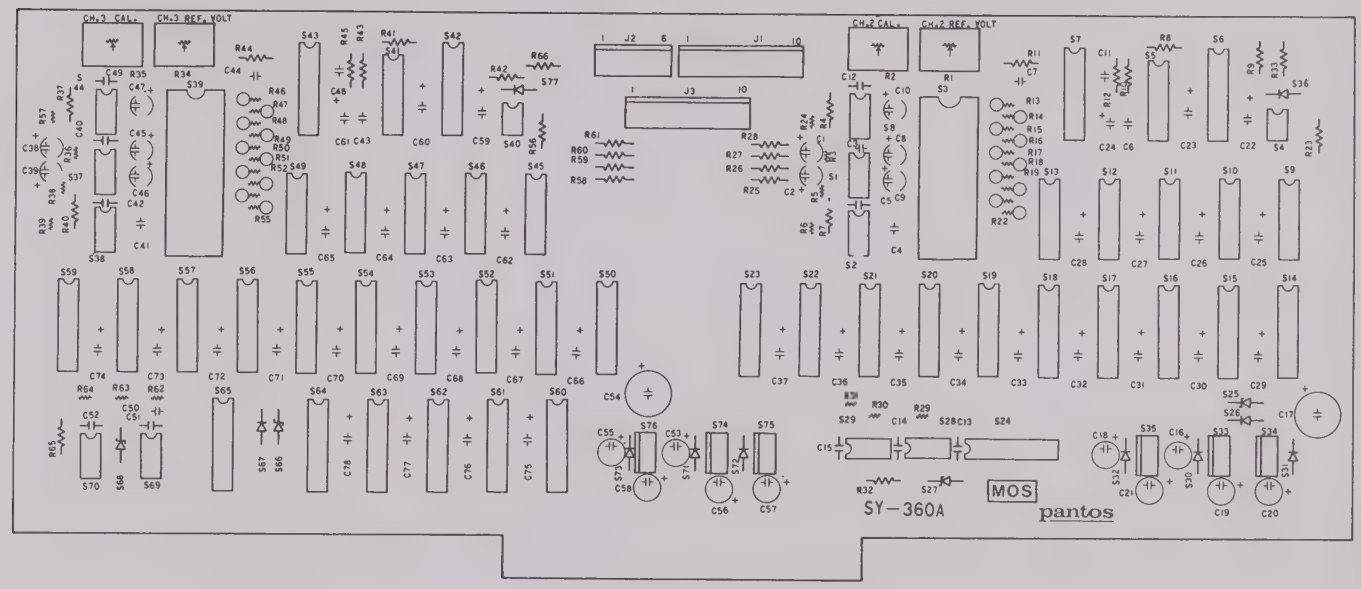


157243

REV

10	TITLE	Schematic Dia. OPTION 11 Synchronizer Interconnections, 1243	SOLTEC® CORPORATION 157243

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



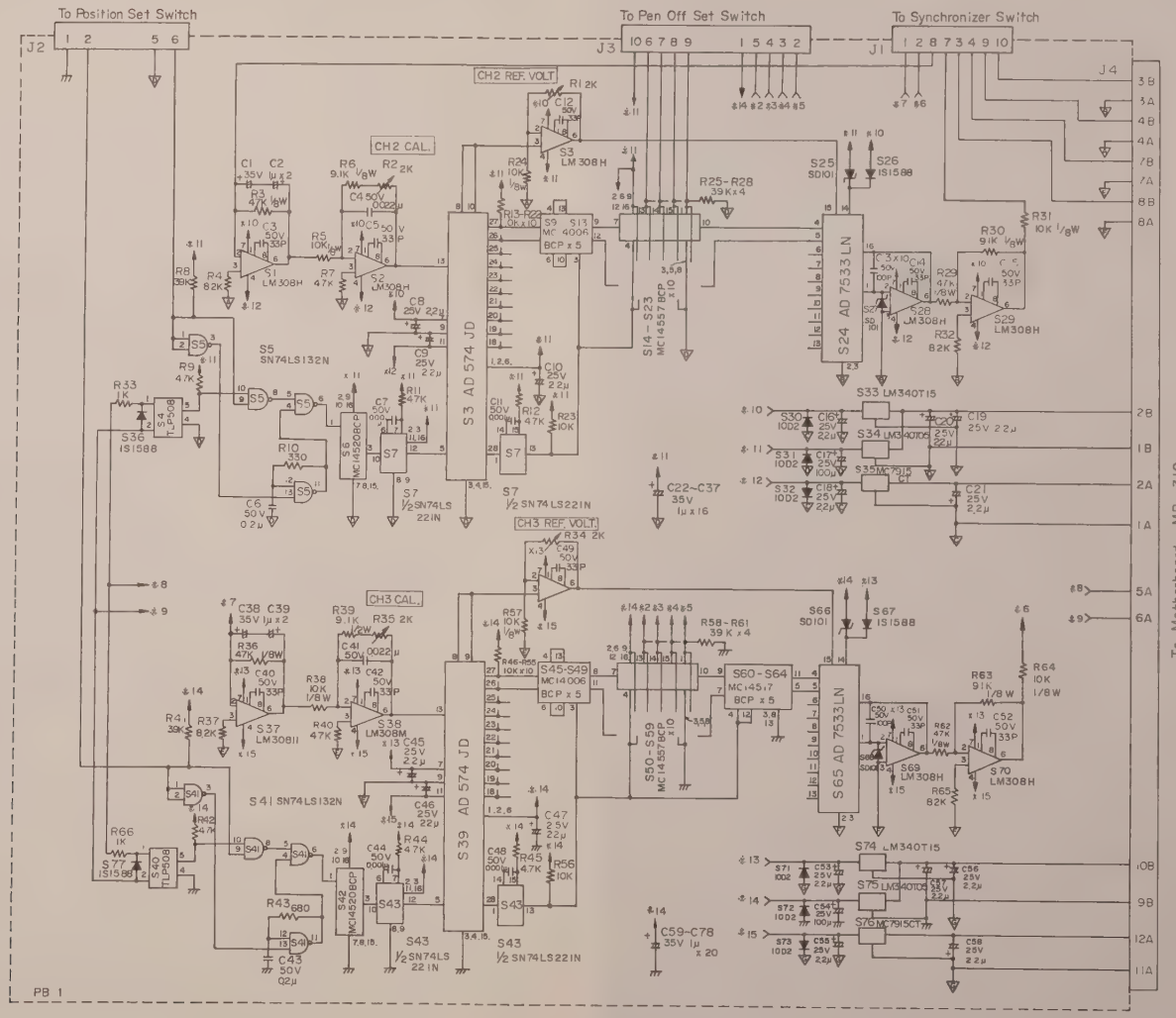
157244

REV

NOTE: 1. REFER TO SCHEMATIC NO. 157245.

IO	TITLE Assembly OPTION 11 Synchronizer, 1243	SOLTEC® CORPORATION 157244

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



NOTE: UNLESS OTHERWISE SPECIFIED.

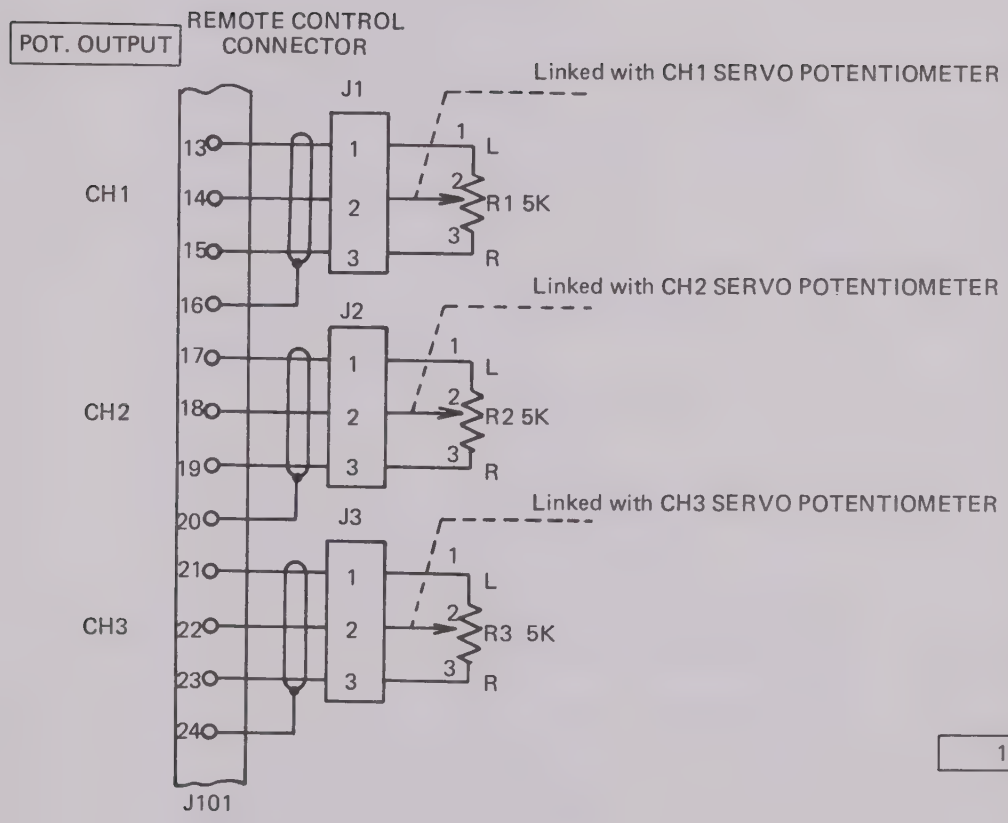
1. ALL RESISTORS ARE IN OHMS, 1/4W.
2. ALL CAPACITORS ARE IN FARADS.
3. REFER TO ASSEMBLY NO. 157244.
4. EACH PORTION HAVING (A) (B) (C) (D) (E) (F) OR (G) IS CONNECTED, AS EACH GROUP, TO A CONNECTOR AND GROUNDED INSIDE THE MOTHERBOARD.
5. C22–C37, C59–C78 ARE GROUNDED BY RESPECTIVE IC PINS.

CAUTION
MOS semiconductors are used.
Use Static Precautions.

IO	TITLE	Schematic Dia. OPTION 11 Synchronizer, 1243	SOLTEC CORPORATION 157245

157245
REV

REVISIONS				
SYM	DESCRIPTION	DATE	CHKD	APPR



157251

REV

JO	TITLE	Schematic Dia. OPTION 12 Retransmitting Potentiometer Output	SOLTEC® CORPORATION
			157251

9.2.2 Parts List

Table No.	Ref. No.	Title
9.1	AR	Models 1241-2 Mainframe Interconnections Parts List
9.2	BR	Model 1243 Mainframe Interconnections Parts List
9.3	CR	Motherboard Parts List
9.4	DR	Motherboard Parts List
9.5	ER	Chart Drive Parts List
9.6.1	AU	MODULE A Attenuator Component Variation List
9.6.2	AU	MODULE A Attenuator Parts List
9.7	BU	MODULE B Attenuator Parts List
9.8.1	CU	MODULE C Attenuator Component Variation List
9.8.2	CU	MODULE C Attenuator Parts List
9.9.1	DU	MODULE D, E & F Attenuator Component Variation List
9.9.2	DU	MODULE D, E & F Attenuator Parts List
9.10	EU	MODULE 8 Attenuator Parts List
9.11	FU	MODULE 8 Convertor Parts List
9.12.1	GU	MODULE A, B, C, D, E, F & 8 Amplifier Component Variation List
9.12.2	GU	MODULE A, B, C, D, E, F & 8 Amplifier Parts List
9.13	HU	MODULE 1 Attenuator Parts List
9.14	IU	MODULE 1 Bias Circuit Parts List
9.15	JU	MODULE 2, 3, 4, 5 & 6 Attenuator Parts List
9.16	KU	MODULE 7 Attenuator Parts List
9.17.1	LU	MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier Component Variation List
9.17.2	LU	MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier Parts List
9.18	MU	MODULE 1 (Linearized) Attenuator Parts List
9.19	NU	MODULE 1 (Linearized) Bias Circuit Parts List
9.20	OU	MODULE 2, 3, 4, 5, 6 & 7 (Linearized) Attenuator Parts List
9.21.1	PU	MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier Component Variation List
9.21.2	PU	MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier Parts List
9.22	AO	OPTION 1 Chart Take-up Parts List
9.23	BO1	OPTION 2 Event Marker Parts List, 1241-2
9.24	BO2	OPTION 2 Event Marker Parts List, 1243
9.25	CO	OPTION 3 Electric Pen Lift Parts List
9.26	DO	OPTION 4 Electric Pen Lift Parts List
9.27	EO	OPTION 5 Electronic Limit Switch Parts List
9.28	FO	OPTION 6 Electronic Limit Switch Parts List
9.29	GO	OPTION 7 Electronic Limit Switch Parts List
9.30	HO	OPTION 10 Synchronizer Parts List
9.31	IO	OPTION 11 Synchronizer Parts List
9.32	JO	OPTION 12 Retransmitting Potentiometer Output

Table 9.1 AR Models 1241-2 Mainframe Interconnections Parts List

Ref. No.	Part No.	Description
AR-R2	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
AR-C1	DE7150FZ 103P	Capacitor - 0.01μF - $^{+100}_{-0}$% - 400V AC - Paper
AR-C2	DE7090B 102K	Capacitor - 0.001μF - ±10% - 400V AC - Paper
AR-C3	DE7090B 102K	Capacitor - 0.001μF - ±10% - 400V AC - Paper
AR-SW1	M-2022	Toggle Switch
AR-M2	KP4M18G 1/24	Stepper Motor
AR-T1	PT-207	Power Transformer
AR-J1	1625-6P-1	Connector - Plug - 6 Pin
	1625-6R	Connector - Receptacle - 6 Pin
AR-J2	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
	IL-10S-S3L	Connector - Plug - 10 Pin
AR-J3	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
	IL-10S-S3L	Connector - Plug - 10 Pin
AR-J4	IL-6P-S3FP2	Connector - Receptacle - 6 Pin
	IL-6S-S3L	Connector - Plug - 6 Pin
AR-J5	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
	IL-3S-S3L	Connector - Plug - 3 Pin
AR-J6	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
	IL-10S-S3L	Connector - Plug - 10 Pin
AR-J12	ML-3182	T Terminal - 3 Pin
AR-J101	317-12-901-05	Type 2 Terminal - Metal
AR-J102	57-40240	Connector - Receptacle - 24 Pin
AR-J201	3250-018-098	Connector - Receptacle - 18 Pin
AR-J202	3250-018-098	Connector - Receptacle - 18 Pin
AR-J203	3250-018-098	Connector - Receptacle - 18 Pin
AR-F1	F7077	Fuse Holder
AR-PL1	BNF-3	Indicator Lamp
AR-R1	P-136 5K	Potentiometer - 5KΩ
AR-M1	DL30S-009	Servo Motor
AR-PB1	MB-278	Motherboard Assembly
AR-PB2	PM-276	Chart Drive P.C. Board Assembly
AR-PB3	SW-291	Chart Paper End Sensor P.C. Board Assembly
AR-PB4	L-281	By-Pass Capacitor P.C. Board Assembly

Table 9.2 BR Model 1243 Mainframe Interconnections Parts List

Ref. No.	Part No.	Description
BR-R2	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
BR-C1	DE7150FZ 103P	Capacitor - 0.01μF - $^{+100}_{0}$% - 400V AC - Paper
BR-C2	DE7090B 102K	Capacitor - 0.001μF - ±10% - 400V AC - Paper
BR-C3	DE7090B 102K	Capacitor - 0.001μF - ±10% - 400V AC - Paper
BR-SW1	M-2022	Toggle Switch
BR-M2	KP4M18G 1/24	Stepper Motor
BR-T1	PT-239	Power Transformer
BR-T2	PT-240	Power Transformer
BR-J1	1625-6P-1	Connector - Plug - 6 Pin
	1625-6R	Connector - Receptacle - 6 Pin
BR-J2	IL-10P-S3FP2	Connector - Receptacle -10 Pin
	IL-10S-S3L	Connector - Plug - 10 Pin
BR-J3	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
	IL-3S-S3L	Connector - Plug - 3 Pin
BR-J4	IL-6P-S3FP2	Connector - Receptacle - 6 Pin
	IL-6S-S3L	Connector - Plug - 6 Pin
BR-J5	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
	IL-3S-S3L	Connector - Plug - 3 Pin
BR-J6	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
	IL-10S-S3L	Connector - Plug - 10 Pin
BR-J7	IL-6P-S3FP2	Connector - Receptacle - 6 Pin
	IL-6S-S3L	Connector - Plug - 6 Pin
BR-J16	ML-3182	T Terminal - 3 Pin
BR-J101	317-12-901-05	Type 2 Terminal - Metal
BR-J102	57-40240	Connector - Receptacle - 24 Pin
BR-J103	3250-018-098	Connector - Receptacle - 18 Pin
BR-J104	3250-018-098	Connector - Receptacle - 18 Pin
BR-J203	3250-018-098	Connector - Receptacle - 18 Pin
BR-F1	F 7077	Fuse Holder
BR-PL1	BNF-3	Indicator Lamp
BR-R1	P-136 5K	Potentiometer - 5KΩ
BR-M1	DL30S-009	Servo Motor
BR-PB1	MB-310	Motherboard Assembly
BR-PB2	PM-276	Chart Drive P.C. Board Assembly
BR-PB3	SW-291	Chart Paper End Sensor P.C. Board Assembly
BR-PB4	L-281	By-Pass Capacitor P.C. Board Assembly

Table 9.3 CR Motherboard Parts List

Ref. No.	Part No.	Description
CR-R1	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
CR-R2	NAS 1/4J 470K	Resistor - 470K - ±5% - 1/4W - Carbon Film
CR-R3	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R4	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R5	NAS 1/4J 100	Resistor - 100 - ±5% - 1/4W - Carbon Film
CR-R6	NAS 1/4J 100	Resistor - 100 - ±5% - 1/4W - Carbon Film
CR-R7	HES 1/2J 430	Resistor - 430 - ±5% - 1/2W - Carbon Film
CR-R8	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
CR-R9	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
CR-R10	NAS 1/4J 33K	Resistor - 33K - ±5% - 1/4W - Carbon Film
CR-R11	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
CR-R12	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R13	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
CR-R14	NAS 1/4J 150	Resistor - 150 - ±5% - 1/4W - Carbon Film
CR-R15	RGP 102 200K	Resistor - Variable - 200K
CR-R16	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
CR-R17	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R18	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W- Carbon Film
CR-R19	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R20	NAS 1/4J 15K	Resistor - 15K - ±5% - 1/4W - Carbon Film
CR-R21	NAS 1/4J 6.8K	Resistor - 6.8K - ±5% - 1/4W - Carbon Film
CR-R22	NAS 1/4J 68K	Resistor - 68K - ±5% - 1/4W - Carbon Film
CR-R23	NAS 1/4J 150K	Resistor - 150K - ±5% - 1/4W - Carbon Film
CR-R24	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
CR-R25	NAS 1/4J 1.5K	Resistor - 1.5K - ±5% - 1/4W - Carbon Film
CR-R26	Jumper	
CR-R27	NAS 1/4J 33K	Resistor - 33K - ±5% - 1/4W - Carbon Film
CR-R28	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
CR-R29	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
CR-R38	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
CR-R39	NAS 1/4J 1.5K	Resistor - 1.5K - ±5% - 1/4W - Carbon Film
CR-C1	DEP(M) 0.01MF	Capacitor - 0.01μF - ±20% - 50V - Polyester
CR-C2	CE04W 10MF	Capacitor - 10μF - $^{+50}_{-10}$% - 25V - Electrolytic
CR-C3	CE04W 3.3MF	Capacitor - 3.3μF - $^{+75}_{-10}$% - 50V - Electrolytic
CR-C4	CE04W 2.2MF B.P.	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic
CR-C5	CE04W 2.2MF B.P.	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic
CR-C6	CE02W 100MF	Capacitor - 100μF - $^{+50}_{-10}$% - 25V - Electrolytic
CR-C7	CE02W 470MF	Capacitor - 470μF - $^{+50}_{-10}$% - 25V - Electrolytic
CR-C9	DEP(M) 0.0047MF	Capacitor - 0.0047μF - ±20% - 50V - Polyester
CR-C10	CE04W 1MF	Capacitor - 1μF - $^{+75}_{-10}$% - 50V - Electrolytic
CR-C11	CE04W 3.3MF	Capacitor - 3.3μF - $^{+75}_{-10}$% - 50V - Electrolytic
CR-C12	DEP(M) 0.022MF	Capacitor - 0.022μF - ±20% - 50V - Polyester
CR-C13	CE04W 2.2MF	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic
CR-C17	DEP(M) 0.01MF	Capacitor - 0.01μF - ±20% - 50V - Polyester

Ref. No.	Part No.	Description
CR-C18	DEP(M) 0.047MF	Capacitor - 0.047μF - ±20% - 50V - Polyester
CR-C19	DEP(M) 0.047MF	Capacitor - 0.047μF - ±20% - 50V - Polyester
CR-S1	H8D-1200	Integrated Circuit
CR-S2	2SC1815Y	Transistor
CR-S3	MC14017BCP	Integrated Circuit
CR-S4	MC14075BCP	Integrated Circuit
CR-S5	MC14075BCP	Integrated Circuit
CR-S6	MC1416 (ULN2004AN)	Integrated Circuit
CR-S7	10D2	Diode
CR-S8	10D2	Diode
CR-S9	10D2	Diode
CR-S10	10D2	Diode
CR-S11	05Z7.5	Zener Diode
CR-S13	1S1588	Diode
CR-S14	1S1588	Diode
CR-S15	1S1588	Diode
CR-S16	2SC1815Y	Transistor
CR-S17	1S1588	Diode
CR-S18	1S1588	Diode
CR-S19	1S1588	Diode
CR-S20	2SC1815Y	Transistor
CR-S21	MC14011BCP	Integrated Circuit
CR-S22	1S1588	Diode
CR-S23	MC14011BCP	Integrated Circuit
CR-S24	MC14011BCP	Integrated Circuit
CR-S25	MC14572BCP	Integrated Circuit
CR-S26	2SC1815Y	Transistor
CR-S27	1S1588	Diode
CR-S28	05Z5.1X	Zener Diode
CR-S40	1S1588	Diode
CR-S41	1S1588	Diode
CR-S42	2SC1815Y	Transistor
CR-S43	2SC1815Y	Transistor
CR-S44	1S1588	Diode
CR-OSC1	EMF-GC600	Micro Tuning Fork - 600Hz
CR-SW1	G2V21 12V	Relay
CR-BZ1	KBS-27DB-3A	Piezo-Buzzer
CR-J2	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
CR-J3	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
CR-J4	IL-6P-S3FP2	Connector - Receptacle - 6 Pin
CR-J5	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
CR-J6	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
CR-J201	3250-018-098	Connector - Receptacle - 18 Pin
CR-J202	3250-018-098	Connector - Receptacle - 18 Pin
CR-J203	3250-018-098	Connector - Receptacle - 18 Pin
CR-PB1	MB-278	Motherboard Assembly

Table 9.4 DR Motherboard Parts List

Ref. No.	Part No.	Description
DR-R1	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
DR-R2	NAS 1/4J 470K	Resistor - 470K - ±5% - 1/4W - Carbon Film
DR-R3	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
DR-R4	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
DR-R5	NAS 1/4J 100	Resistor - 100 - ±5% - 1/4W - Carbon Film
DR-R6	NAS 1/4J 100	Resistor - 100 - ±5% - 1/4W - Carbon Film
DR-R7	HES 1/2J 430	Resistor - 430 - ±5% - 1/2W - Carbon Film
DR-R8	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R9	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W- Carbon Film
DR-R10	NAS 1/4J 33K	Resistor - 33K - ±5% - 1/4W - Carbon Film
DR-R11	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R12	NAS 1/4J 47K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R13	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
DR-R14	NAS 1/4J 150	Resistor - 150 - ±5% - 1/4W - Carbon Film
DR-R15	RGP 102 200K	Resistor - Variable - 200K
DR-R16	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R17	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
DR-R18	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R19	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
DR-R20	NAS 1/4J 15K	Resistor - 15K - ±5% - 1/4W - Carbon Film
DR-R21	NAS 1/4J 6.8K	Resistor - 6.8K - ±5% - 1/4W - Carbon Film
DR-R22	NAS 1/4J 68K	Resistor - 68K - ±5% - 1/4W - Carbon Film
DR-R23	NAS 1/4J 150K	Resistor - 150K - ±5% - 1/4W - Carbon Film
DR-R24	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
DR-R25	NAS 1/4J 1.5K	Resistor - 1.5K - ±5% - 1/4W - Carbon Film
DR-R26	Jumper	
DR-R27	NAS 1/4J 33K	Resistor - 33K - ±5% - 1/4W - Carbon Film
DR-R28	NAS 1/4J 4.7K	Resistor - 4.7K - ±5% - 1/4W - Carbon Film
DR-R29	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
DR-R40	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film
DR-R41	NAS 1/4J 1.5K	Resistor - 1.5K - ±5% - 1/4W - Carbon Film
DR-C1	DEP(M) 0.01MF	Capacitor - 0.01μF - ±20% - 50V - Polyester
DR-C2	CE04W 10MF	Capacitor - 10μF - $^{+50}_{-10}$% - 25V - Electrolytic
DR-C3	CE04W 3.3MF	Capacitor - 3.3μF - $^{+75}_{-10}$% - 50V - Electrolytic
DR-C4	CE04W 2.2MF B.P.	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic
DR-C5	CE04W 2.2MF B.P.	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic
DR-C6	CE02W 100MF	Capacitor - 100μF - $^{+50}_{-10}$% - 25V - Electrolytic
DR-C7	CE02W 470MF	Capacitor - 470μF - $^{+50}_{-10}$% - 25V - Electrolytic
DR-C9	DEP(M) 0.0047MF	Capacitor - 0.0047μF - ±20% - 50V - Polyester
DR-C10	CE04W 1MF	Capacitor - 1μF - $^{+75}_{-10}$% - 50V - Electrolytic
CR-C11	CE04W 3.3MF	Capacitor - 3.3μF - $^{+75}_{-10}$% - 50V - Electrolytic
DR-C12	DEP(M) 0.022MF	Capacitor - 0.022μF - ±20% - 50V - Polyester
DR-C13	CE04W 2.2MF B.P.	Capacitor - 2.2μF - $^{+75}_{-10}$% - 25V - Electrolytic

Ref. No.	Part No.	Description
DR-C17	DEP(M) 0.01MF	Capacitor - 0.01μF - ±20% - 50V - Polyester
DR-C18	DEP(M) 0.047MF	Capacitor - 0.047μF - ±20% - 50V - Polyester
DR-C19	DEP(M) 0.047MF	Capacitor - 0.047μF - ±20% - 50V - Polyester
DR-S1	H8D-1200	Integrated Circuit
DR-S2	2SC1815Y	Transistor
DR-S3	MC14017BCP	Integrated Circuit
DR-S4	MC14075BCP or CD4075BE	Integrated Circuit
DR-S5	MC14075BCP or CD4075BE	Integrated Circuit
DR-S6	MC1416 (ULN2004AN)	Integrated Circuit
DR-S7	10D2	Diode
DR-S8	10D2	Diode
DR-S9	10D2	Diode
DR-S10	10D2	Diode
DR-S11	05Z7.5	Zener Diode
DR-S12	1S1588	Diode
DR-S13	1S1588	Diode
DR-S14	1S1588	Diode
DR-S15	1S1588	Diode
DR-S16	2SC1815Y	Transistor
DR-S17	1S1588	Diode
DR-S18	1S1588	Diode
DR-S19	1S1588	Diode
DR-S20	2SC1815Y	Transistor
DR-S21	MC14011BCP	Integrated Circuit
DR-S22	1S1588	Diode
DR-S23	MC14011BCP	Integrated Circuit
DR-S24	MC14011BCP	Integrated Circuit
DR-S25	MC14572BCP	Integrated Circuit
DR-S26	2SC1815Y	Transistor
DR-S27	1S1588	Diode
DR-S28	2SC1815Y	Transistor
DR-S42	1S1588	Diode
DR-S43	1S1588	Diode
DR-S44	1S1588	Diode
DR-S45	2SC1815Y	Transistor
DR-S46	2SC1815Y	Transistor
DR-S47	05Z5.1X	Zener Diode
DR-OSC1	EMF-GC600	Micro Tuning Fork - 600Hz
DR-SW1	LZN4-1020B 12V	Relay
DR-BZ1	KBS-27DB-3A	Piezo-Buzzer
DR-J2	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
DR-J3	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
DR-J4	IL-6P-S3FP2	Connector - Receptacle - 6 Pin

Ref. No.	Part No.	Description
DR-J5	IL-3P-S3FP2	Connector - Receptacle - 3 Pin
DR-J6	IL-10P-S3FP2	Connector - Receptacle - 10 Pin
DR-J7	IL-6P-S3FP2	Connector - Receptacle - 6 Pin
DR-J201	3250-018-098	Connector - Receptacle - 18 Pin
DR-J202	3250-018-098	Connector - Receptacle - 18 Pin
DR-J203	3250-018-098	Connector - Receptacle - 18 Pin
DR-PB1	MB-310	Motherboard Assembly

Table 9.5 ER Chart Drive Parts List

Ref. No.	Part No.	Description
ER-R1	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
ER-R2	NAS 1/4J 47K	Resistor - 47K - ±5% - 1/4W - Carbon Film
ER-R3	HES 1/2J 680	Resistor - 680 - ±5% - 1/2W - Carbon Film
ER-C1	DEP(M) 0.047MF	Capacitor - 0.047μF - ±20% - 50V - Polyester
ER-S1	MC14017BCP	Integrated Circuit
ER-S2	MC14520BCP	Integrated Circuit
ER-S3	MC14518BCP	Integrated Circuit
ER-S4	MC14566BCP	Integrated Circuit
ER-S5	MC14011BCP	Integrated Circuit
ER-SW1	8532ZQ	Push-Button Switch
ER-SW2	DVSW 1-6	Slide Switch
ER-SW3	DVSW 1-6	Slide Switch
ER-SW4	8532ZQ	Push-Button Switch
ER-SW5	7101SD9V30B	Toggle Switch
ER-PL1	MV-5024	L.E.D.
ER-PB1	PM-276	Chart Drive P.C. Board Assembly

Table 9.6.1 AU MODULE A Attenuator Component Variation List

Ref. No.	Part No.	Description
• Meas. Range: 1, 2, 5, 10, 20 or 50mV		
AU-R1	Jumper	
AU-R2	NOT REQUIRED	
• Meas. Range: 100, 200, 500mV, 1, 2 or 5V		
AU-R1	RN92E-2H-994G	Resistor - 990K - ±2% - 1/2W - Metal Film
AU-R2	RN92E-2B-103G	Resistor - 10K - ±2% - 1/8W - Metal Film
• Meas. Range: 10, 20, 50, 100 or 200V		
AU-R1	RN92E-2H-105G	Resistor - 1M - ±2% - 1/2W - Metal Film
AU-R2	RN92E-2B-101G	Resistor - 100 - ±2% - 1/8W - Metal Film

Table 9.6.2 AU MODULE A Attenuator Parts List

Ref. No.	Part No.	Description
AU-R1	Refer to Table 9.6.1	
AU-R2	Refer to Table 9.6.1	
AU-R3	P-182 with Switch 20K	Resistor - Variable - 20K
AU-R4	P-116 5K	Resistor - Variable - 5K
AU-SW1	M-2020	Toggle Switch
AU-J101	317-12-901-01	Type 2 Terminal - Red
AU-J102	317-12-901-02	Type 2 Terminal - Black

Table 9.7 BU MODULE B Attenuator Parts List

Ref. No.	Part No.	Description
BU-R1	RN92E-2H-994B	Resistor - 990K - ±0.1% - 1/2W - Metal Film
BU-R2	RN92E-2B-992A	Resistor - 9.9K - ±0.05% - 1/8W - Metal Film
BU-R3	RN92E-2B-101A	Resistor - 100 - ±0.05% - 1/8W - Metal Film
BU-R4	RE35YQ-4.7KF	Resistor - 4.7K - ±1% - 1/4W - Metal Film
BU-R5	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
BU-R6	RN92E-2E-204B	Resistor - 200K - ±0.1% - 1/4W - Metal Film
BU-R7	RN92E-2E-124B	Resistor - 120K - ±0.1% - 1/4W - Metal Film
BU-R8	RN92E-2B-403B	Resistor - 40K - ±0.1% - 1/8W - Metal Film
BU-R9	RN92E-2B-203B	Resistor - 20K - ±0.1% - 1/8W - Metal Film
BU-R10	RN92E-2B-123B	Resistor - 12K - ±0.1% - 1/8W - Metal Film
BU-R11	RN92E-2B-782A	Resistor - 7.8K - ±0.05% - 1/8W - Metal Film
BU-R12	P-182 20K	Resistor - Variable - 20K
BU-R13	P-116 5K	Resistor - Variable - 5K
BU-SW1	M-2020	Toggle Switch
BU-SW2	853-30-005	Rotary Switch
BU-J101	317-12-901-01	Type 2 Terminal - Red
BU-J102	317-12-901-02	Type 2 Terminal - Black
BU-PB1	IA-280	AMP P.C. Board Assembly

Table 9.8.1 CU MODULE C Attenuator Component Variation List

Ref. No.	Part No.	Description
• Meas. Range: 1, 2, 5, 10, 20 or 50μA		
CU-R1	RN92E-2B-102G	Resistor - 1K - ±2% - 1/8W - Metal Film
• Meas. Range: 100, 200, 500μA, 1, 2 or 5mA		
CU-R1	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
• Meas. Range: 10, 20, 50, 100, 200 or 500mA		
CU-R1	701-00-001	Resistor - 0.1 - ±0.1% - 0.15W - Wire Wound

Table 9.8.2 CU MODULE C Attenuator Parts List

Ref. No.	Part No.	Description
CU-R1	Refer to Table 9.8.1	
CU-R2	P-182 with Switch 20K	Resistor - Variable - 20K
CU-R3	P-116 5K	Resistor - Variable - 5K
CU-J101	317-12-901-01	Type 2 Terminal - Red
CU-J102	317-12-901-02	Type 2 Terminal - Black
CU-SW1	M-2020	Toggle Switch
CU-PB1	IA-280	AMP P.C. Board Assembly

Table 9.9.1 DU MODULE D, E & F Attenuator Component Variation List

Ref. No.	Part No.	Description
MODULE D:		
DU-R1	RN92E-2B-102G	Resistor - 1K - ±2% - 1/8W - Metal Film
MODULE E:		
DU-R1	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
MODULE F:		
DU-R1	701-00-001	Resistor - 0.1 - ±0.1% - 0.15W - Wire Wound

Table 9.9.2 DU MODULE D, E & F Attenuator Parts List

Ref. No.	Part No.	Description
DU-R1	Refer to Table 9.9.1	
DU-R2	RN92E-2E-204B	Resistor - 200K - ±0.1% - 1/4W - Metal Film
DU-R3	RN92E-2E-124B	Resistor - 120K - ±0.1% - 1/4W - Metal Film
DU-R4	RN92E-2B-403B	Resistor - 40K - ±0.1% - 1/8W - Metal Film
DU-R5	RN92E-2B-203B	Resistor - 20K - ±0.1% - 1/8W - Metal Film
DU-R6	RN92E-2B-123B	Resistor - 12K - ±0.1% - 1/8W - Metal Film
DU-R7	RN92E-2B-782A	Resistor - 7.8K - ±0.05% - 1/8W - Metal Film
DU-R8	P-182 with Switch 20K	Resistor - Variable - 20K
DU-R9	P-116 5K	Resistor - Variable - 5K
DU-SW1	M-2020	Toggle Switch
DU-SW2	RS-400NB 1-1-6	Rotary Switch
DU-J101	317-12-901-01	Type 2 Terminal - Red
DU-J102	317-12-901-02	Type 2 Terminal - Black
DU-PB1	IA-280	AMP P.C. Board Assembly

Table 9.10 EU MODULE 8 Attenuator Parts List

Ref. No.	Part No.	Description
EU-R1	RJ-13B 5K	Resistor - Variable - 5K
EU-J1	IL-3S-S3L	Connector-plug - 3 Pin
EU-J2	IL-12S-S3L	Connector-plug - 12 Pin
EU-J103	317-12-901-01	Type 2 Terminal - Red
EU-J104	317-12-901-01	Type 2 Terminal - Red
EU-J105	317-12-901-01	Type 2 Terminal - Red
EU-SW1	RS-700BE 1-3-3	Rotary Switch
EU-SW2	M-2020	Toggle Switch
EU-PB1	RTD-359	Converter P.C. Board Assembly
EU-PB2	IA-280	AMP P.C. Board Assembly

Table 9.11 FU MODULE 8 Convertor Parts List

Ref. No.	Part No.	Description
FU-R1	RE50YQ-681G	Resistor - 680 - ±2% - 1/4W - Metal Film
FU-R2	RN92E-2B-422G	Resistor - 4.2K - ±2% - 1/8W - Metal Film
FU-R3	RN92E-2B-101G	Resistor - 100 - ±2% - 1/8W - Metal Film
FU-R4	RN92E-2B-403B	Resistor - 40K - ±0.1% - 1/8W - Metal Film
FU-R5	RN92E-2B-203G	Resistor - 20K - ±2% - 1/8W - Metal Film
FU-R6	RN92E-2B-403B	Resistor - 40K - ±0.1% - 1/8W - Metal Film
FU-R7	RE35YQ-512F	Resistor - 5.1K - ±1% - 1/4W - Metal Film
FU-R8	RE35YQ-512F	Resistor - 5.1K - ±1% - 1/4W - Metal Film
FU-R9	λ-6T 10K	Resistor - Variable - 10K
FU-R10	RE50YQ-681G	Resistor - 680 - ±2% - 1/4W - Metal Film
FU-R11	RN92E-2B-511G	Resistor - 510 - ±2% - 1/8W - Metal Film
FU-R12	RN92E-2B-511G	Resistor - 510 - ±2% - 1/8W - Metal Film
FU-R13	RN92E-2B-511G	Resistor - 510 - ±2% - 1/8W - Metal Film
FU-R14	RN92E-2B-622G	Resistor - 6.2K - ±2% - 1/8W - Metal Film
FU-R15	RN92E-2B-622G	Resistor - 6.2K - ±2% - 1/8W - Metal Film
FU-R16	RN92E-2B-223G	Resistor - 22K - ±2% - 1/8W - Metal Film
FU-R17	λ-6T 2K	Resistor - Variable - 2K
FU-R18	λ-6T 2K	Resistor - Variable - 2K
FU-R19	λ-6T 2K	Resistor - Variable - 2K
FU-R20	RN92E-2H-754G	Resistor - 750K - ±2% - 1/2W - Metal Film
FU-R21	RJ-6P 200K	Resistor - Variable - 200K
FU-C1	DD105CH330J	Capacitor - 33pF - ±5% - 50V - Ceramic
FU-S1	1N3155	Zener Diode
FU-S2	LM301AN	Integrated Circuit
FU-S3	2SC1815Y	Transistor
FU-S4	1S1588	Diode
FU-S5	1S1588	Diode
FU-S6	OP-05CT	Integrated Circuit
FU-S7	1N3155	Zener Diode
FU-J1	IL-3P-S3EN2	Connector - Receptacle - 3 Pin
FU-J2	IL-12P-S3EN2	Connector - Receptacle - 12 Pin
FU-PB1	RTD-359	Converter P.C. Board Assembly

Table 9.12.1 GU MODULE A, B, C, D, E, F & 8 Amplifier Component Variation List

Ref. No.	Part No.	Description
MODULE A:		
• Meas. Range: 1mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
• Meas. Range: 2mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-200G	Resistor - 20 - ±2% - 1/8W - Metal Film
• Meas. Range: 5mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-510G	Resistor - 51 - ±2% - 1/8W - Metal Film
• Meas. Range: 10mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-101G	Resistor - 100 - ±2% - 1/8W - Metal Film
• Meas. Range: 20mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
• Meas. Range: 50mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-511G	Resistor - 510 - ±2% - 1/8W - Metal Film
• Meas. Range: 100mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-102G	Resistor - 1K - ±2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
• Meas. Range: 200mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-202G	Resistor - 2K - ±2% - 1/8W - Metal Film
• Meas. Range: 500mV		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RM92E-2B-683G	Resistor - 68K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-512G	Resistor - 5.1 - ±2% - 1/8W - Metal Film
• Meas. Range: 1V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ±2% - 1/8W - Metal Film
• Meas. Range: 2V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ±2% - 1/8W - Metal Film
• Meas. Range: 5V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ±2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ±2% - 1/8W - Metal Film
• Meas. Range: 10V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor -10K - ±2% - 1/8W - Metal Film
• Meas. Range: 20V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ±1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ±2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ±2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ±2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ±2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
• Meas. Range: 50V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 100V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 200V		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
MODULE B:		
• Meas. Range: 1mV to 200V		
GU-R1	RE35YQ-4.7KF	Resistor - 4.7K - ± 1% - 1/4W - Metal Film
GU-R3	NOT REQUIRED	
GU-R4	RN92E-2B-201A	Resistor - 200 - ± 0.05% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-100G	Resistor - 10 - ± 2% - 1/8W - Metal Film
MODULE C:		
• Meas. Range: 1μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-100G	Resistor - 10 - ± 2% - 1/8W - Metal Film
• Meas. Range: 2μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-200G	Resistor - 20 - ± 2% - 1/8W - Metal Film
• Meas. Range: 5μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-510G	Resistor - 51 - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
• Meas. Range: 10μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40 K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-101G	Resistor - 100 - ± 2% - 1/8W - Metal Film
• Meas. Range: 20 μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
• Meas. Range: 50 μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-511G	Resistor - 510 - ± 2% - 1/8W - Metal Film
• Meas. Range: 100 μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-102G	Resistor - 1K - ± 2% - 1/8W - Metal Film
• Meas. Range: 200 μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-202G	Resistor - 2K - ± 2% - 1/8W - Metal Film
• Meas. Range: 500μA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-683G	Resistor - 68K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-512G	Resistor - 5.1K - ± 2% - 1/8W - Metal Film
• Meas. Range: 1mA		
GU-R1	RE35YQ-10F	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
• Meas. Range: 2mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 5mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 10mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-404G	Resistor - 400K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 20mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-204G	Resistor - 200K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 50mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2E-803G	Resistor - 80K - ± 2% - 1/4W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 100mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-403G	Resistor - 40K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
• Meas. Range: 200mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
• Meas. Range: 500mA		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-623G	Resistor - 62K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-511G	Resistor - 510 - ± 2% - 1/8W - Metal Film
MODULE D, E & F:		
GU-R1	RE35YQ-4.7KF	Resistor - 4.7K - ± 1% - 1/4W - Metal Film
GU-R3	NOT REQUIRED	
GU-R4	RN92E-2B-201A	Resistor - 200 - ± 0.05% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-100G	Resistor - 10 - ± 2% - 1/8W - Metal Film
MODULE 8:		
GU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	RN92E-2B-782G	Resistor - 7.8K - ± 2% - 1/8W - Metal Film
GU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
GU-R66	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
GU-R67	RN92E-2B-511G	Resistor - 510 - ± 2% - 1/8W - Metal Film

Table 9.12.2 GU MODULE A, B, C, D, E, F & 8 Amplifier Parts List

Ref. No.	Part No.	Description
GU-R1	Refer to Table 9.12.1.	
GU-R2	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
GU-R3	Refer to Table 9.12.1.	
GU-R4	Refer to Table 9.12.1.	
GU-R5	NAS 1/4J 22K	Resistor - 22K - ± 5% - 1/4W - Carbon Film
GU-R6	NAS 1/4J 22K	Resistor - 22K - ± 5% - 1/4W - Carbon Film
GU-R7	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
GU-R8	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
GU-R9	RGP-103 5K	Resistor - Variable - 5K
GU-R10	RGP-103 5K	Resistor - Variable - 5K
GU-R11	RE 1/4K 500M	Resistor - 500M - ± 10% - 1/4W - Carbon Film
GU-R12	HES 1/2J 2M	Resistor - 2M - ± 5% - 1/2W - Carbon Film
GU-R13	NAS 1/4J 150K	Resistor - 150K - ± 5% - 1/4W - Carbon Film
GU-R15	NAS 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
GU-R16	NAS 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
GU-R17	NAS 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
GU-R18	NAS 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
GU-R21	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
GU-R22	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
GU-R23	Jumper	
GU-R24	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
GU-R25	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
GU-R26	NAS 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
GU-R27	HES 1/2J 2M	Resistor - 2M - ± 5% - 1/2W - Carbon Film
GU-R28	NAS 1/4J 150	Resistor - 150 - ± 5% - 1/4W - Carbon Film
GU-R29	NAS 1/4J 3.3K	Resistor - 3.3K - ± 5% - 1/4W - Carbon Film
GU-R30	NAS 1/4J 3K	Resistor - 3K - ± 5% - 1/4W - Carbon Film
GU-R31	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
GU-R32	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R33	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R34	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
GU-R35	RN92E-2B-103B	Resistor - 10K - ± 0.1% - 1/8W - Metal Film
GU-R36	RN92E-2B-103B	Resistor - 10K - ± 0.1% - 1/8W - Metal Film
GU-R37	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R38A	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
GU-R39	λ-13S 2K	Resistor - Variable - 2K
GU-R40	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
GU-R41	RGP-103 20K	Resistor - Variable - 20K
GU-R42	NAS 1/4J 1M	Resistor - 1M - ± 5% - 1/4W - Carbon Film
GU-R43	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
GU-R44	RN92E-2E-104F	Resistor - 100K - ± 1% - 1/4W - Metal Film
GU-R45	RN92E-2E-104F	Resistor - 100K - ± 1% - 1/4W - Metal Film
GU-R46	NAS 1/4J 47K	Resistor - 47K - ± 5% - 1/4W - Carbon Film

Ref. No.	Part No.	Description
GU-R47	RN92E-2B-193F	Resistor - 19K - ± 1% - 1/8W - Metal Film
GU-R48	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
GU-R49	NAS 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
GU-R50	RGP-103 100K	Resistor - Variable - 100K
GU-R51	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
GU-R52	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
GU-R53	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Metal Film
GU-R54	NAS 1/4J 2.2K	Resistor - 2.2K - ± 5% - 1/4W - Carbon Film
GU-R55	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
GU-R56	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
GU-R57	NAS 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
GU-R58	NAS 1/4J 22K	Resistor - 22K - ± 5% - 1/4W - Carbon Film
GU-R59	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R60	NAS 1/4J 1.2K	Resistor - 1.2K - ± 5% - 1/4W - Carbon Film
GU-R61	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
GU-R62	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
GU-R63	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
GU-R64	NAS 1/4J 680	Resistor - 680 - ± 5% - 1/4W - Carbon Film
GU-R65	λ-13S 20K	Resistor - Variable - 20K
GU-R66	Refer to Table 9.12.1.	
GU-R67	Refer to Table 9.12.1.	
GU-R68	NAS 1/4J 3K	Resistor - 3K - ± 5% - 1/4W - Carbon Film
GU-R69	RE35YQ -33KF	Resistor - 33K - ± 1% - 1/4W - Metal Film
GU-R70	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R71	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
GU-R72	Jumper	
GU-C1	DEP(J) 0.068MF	Capacitor - 0.068 μF - ± 5% - 50V - Poleyster
GU-C2	196D474X0035HA1	Capacitor - 0.47 μF - ± 20% - 35V - Tantalum
GU-C3	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
GU-C4	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester
GU-C5	DEP (M) 0.0022MF	Capacitor - 0.0022 μF - ± 20% - 50V - Polyester
GU-C6	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
GU-C7	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
GU-C8	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
GU-C9	CE04W 4.7MF B.P.	Capacitor - 4.7 μF - $^{+\ 100}_{-\ 10}$ %- 25V - Electrolytic
GU-C10	DD104CH100D	Capacitor - 10 pF - ± 5% - 50V - Ceramic
GU-C11	CE04W 47MF	Capacitor - 47 μF - $^{+\ 50}_{-\ 10}$ % - 16V - Electrolytic
GU-C12	CE04W 47MF	Capacitor - 47 μF - $^{+\ 50}_{-\ 10}$% - 16V - Electrolytic
GU-C13	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
GU-C14A	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
GU-C15	196D474X0035HA1	Capacitor - 0.47 μF - ± 20% - 35V - Tantalum
GU-C16	DEP (M) 0.47	Capacitor - 0.47 μF - ± 20% - 50V - Polyester
GU-C17	DD105CH330J	Capacitor - 33 pF ± 5% - 50V - Ceramic
GU-C19	CE04W 47MF	Capacitor - 47 μF - $^{+\ 50}_{-\ 10}$ % - 16V - Electrolytic

Ref. No.	Part No.	Description
GU-C20	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$ % - 16V - Electrolytic
GU-C21	CE04W 47MF B.P.	Capacitor - 47 μF - $^{+75}_{-10}$ % - 10V - Electrolytic
GU-C22	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
GU-C23	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
GU-C24	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
GU-C25	CE04W 1MF	Capacitor - 1 μF - $^{+75}_{-10}$ % - 50V - Electrolytic
GU-C26	CE04W 1MF	Capacitor - 1 μF - $^{+75}_{-10}$ % - 50V - Electrolytic
GU-C27	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
GU-C28	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
GU-C29	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
GU-S1	02BZ3.3	Zener Diode
GU-S2	MC14093BCP	Integrated Circuit
GU-S3	2SK18Y	Field-Effect Transistor
GU-S4	2SC1344E	Transistor
GU-S5	2SC1344E	Transistor
GU-S6	LM301AN	Integrated Circuit
GU-S7	2SK30A GR	Field-Effect Transistor
GU-S8	TL082CP or TL062CP or TL072CP or LF353N	Integrated Circuit
GU-S9	TLP508	Opto Coupled Isolator
GU-S10	IN3155	Zener Diode
GU-S11	TL082CP or TL062CP or TL072CP or LF353N	Integrated Circuit
GU-S12	LM301AN	Integrated Circuit
GU-S13	2SC1815Y	Transistor
GU-S14	2SC1815Y	Transistor
GU-S15	2SA1015Y	Transistor
GU-S16	2SA1015Y	Transistor
GU-S17	1S1588	Diode
GU-S18	1S1588	Diode
GU-S19	2SC1815Y	Transistor
GU-S20	2SA1015Y	Transistor
GU-S21	1S1588	Diode
GU-S22	1S1588	Diode
GU-S25	2SC1815Y	Transistor
GU-S26	2SA1015Y	Transistor
GU-S27	2SB434Y	Transistor
GU-S28	2SD880Y	Transistor
GU-S29	W02	Rectifier
GU-S30	LM340T15	Integrated Circuit
GU-S31	MC7915CT	Integrated Circuit

Ref. No.	Part No.	Description
GU-S32	10D2	Diode
GU-S33	10D2	Diode
GU-S34	W02	Rectifier
GU-S35	IN3155	Zener Diode
GU-SW1	7101MD9AB	Toggle Switch
GU-L1	FT-18D	Choke
GU-PB1	IA-280	AMP P.C. Board Assembly

Table 9.13 HU MODULE 1 Attenuator Parts List

Ref. No.	Part No.	Description
HU-R1	RJ-13B 5K	Resistor - Variable - 5K
HU-R2	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
HU-SW1	RS-700BE 1-3-3	Rotary Switch
HU-SW2	M-2020	Toggle Switch
HU-J101	317-12-901-01	Type 2 Terminal-Red
HU-J102	317-12-901-02	Type 2 Terminal-Black
HU-PB1	LR-343	AMP P.C. Board Assembly
HU-PB2	BI-384	Bias Circuit P.C. Board Assembly

Table 9.14 IU MODULE 1 Bias Circuit Parts List

Ref. No.	Part No.	Description
IU-R1	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
IU-R2	RJ-6P 10K	Resistor - Variable-10K
IU-R3	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
IU-R10	Jumper	
IU-R13	Jumper	
IU-R14	RN92E-2B-432G	Resistor - 4.3K - ± 2% - 1/8W - Metal Film
IU-C1	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IU-S1	LM301AM	Integrated Circuit
IU-J1	IL-10P-S3EN2	Connector - Receptacle - 10 pin
IU-PB2	BI-384	Bias Circuit P.C. Board Assembly

Table 9.15 JU MODULE 2, 3, 4, 5 & 6 Attenuator Parts List

Ref. No.	Part No.	Description
JU-R1	RJ-13B 5K	Resistor-Variable - 5K
JU-R2	RN92E-2B-100G	Resistor - 10 - ± 2% - 1/8W - Metal Film
JU-R3	Incorporated in JU-J1	
JU-SW1	RS-700BE 1-3-3	Rotary Switch
JU-SW2	M-2020	Toggle Switch
JU-SW3	MFS-201	Slide Switch
JU-J1	757-90-002	Input Terminal for Thermocouple (JU-R3, 240Ω at 0°C X 2 is incorporated.)
JU-PB1	LR-343	AMP P.C. Board Assembly

Table 9.16 KU MODULE 7 Attenuator Parts List

Ref. No.	Part No.	Description
KU-R1	RJ-13B 5 K	Resistor - Variable - 5K
KU-R2	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
KU-R3	Incorporated in KU-J1	
KU-SW1	RS-70DBE 1-3-3	Rotary Switch
KU-SW2	M-2020	Toggle Switch
KU-SW3	MFS-201	Slide Switch
KU-J1	757-90-002	Input Terminal for Thermocouple (KU-R3, 240Ω at 0°C X 2 is incorporated.)
KU-PB1	LR-343	AMP P.C. Board Assembly)

Table 9.17.1 LU MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier Component Variation List

Ref. No.	Part No.	Description
MODULE 1:		
LU-R57	RN92E-2B-150G	Resistor - 16 - ±2% - 1/8W - Metal Film
LU-R91	RN92E-2E-304G	Resistor - 300K - ±2% - 1/4W - Metal Film
LU-R92	RJ-6S 50K	Resistor - Variable - 50K
LU-R93	RJ92E-2E-104G	Resistor - 100K - ±2% - 1/4W - Metal Film
LU-R94	RJ-6S 20K	Resistor - Variable - 20K
LU-R95	RN92E-2B-273G	Resistor - 27K - ±2% - 1/8W - Metal Film
LU-R96	RJ-6S 10K	Resistor - Variable - 10K
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	NOT REQUIRED	
LU-R115	NOT REQUIRED	
LU-R116	NOT REQUIRED	
LU-R117	NOT REQUIRED	
LU-R118	NOT REQUIRED	
LU-R119	NOT REQUIRED	
LU-R120	NOT REQUIRED	
LU-R121	NOT REQUIRED	
MODULE 2:		
LU-R57	RN92E-2B-161G	Resistor - 160 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2B-243G	Resistor - 24K - ± 2%- 1/8W- Metal Film
LU-R92	RJ-6S 10K	Resistor - Variable - 10K
LU-R93	RN92E-2B-113G	Resistor - 11K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 5K	Resistor - Variable - 5K
LU-R95	RN92E-2B-512G	Resistor - 5.1K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 2K	Resistor - Variable - 2K
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2E-104F	Resistor - 100K - ± 1% - 1/4W - Metal Film
LU-R116	RJ-6S 10K	Resistor - Variable - 10K
LU-R117	RN92E-2B-332F	Resistor - 3.3K - ± 1% - 1/8W - Metal Film
LU-R118	RN92E-2B-820G	Resistor - 82 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-102G	Resistor - 1K - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-242G	Resistor - 2.4K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 500	Resistor - Variable - 500
MODULE 3:		
LU-R57	RN92E-2B-131G	Resistor - 130 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2B-333G	Resistor - 33K - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
LU-R92	RJ-6S 10K	Resistor - Variable - 10K
LU-R93	RN92E-2B-163G	Resistor - 16K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 5K	Resistor - Variable - 5K
LU-R95	RN92E-2B-752G	Resistor - 7.5K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 2K	Resistor - Variable - 2K
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2B-753F	Resistor - 75K - ± 1% - 1/8W - Metal Film
LU-R116	RJ-6S 5K	Resistor - Variable - 5K
LU-R117	RN92E-2B-332F	Resistor - 3.3K ± 1% - 1/8W - Metal Film
LU-R118	TN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-162G	Resistor - 1.6K - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-182G	Resistor - 1.8K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 500	Resistor - Variable - 500
MODULE 4:		
LU-R57	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2B-223G	Resistor - 22K - ± 2% - 1/8W - Metal Film
LU-R92	RJ-6S 5K	Resistor - Variable - 5K
LU-R93	RN92E-2B-113G	Resistor - 11K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 2K	Resistor - Variable - 2K
LU-R95	RN92E-2B-682G	Resistor - 6.8K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 2K	Resistor - Variable - 2K
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2E-823F	Resistor - 82K - ± 1% - 1/4W - Metal Film
LU-R116	RJ-6S 5K	Resistor - Variable - 5K
LU-R117	RN92E-2B-362F	Resistor - 3.6K - ± 1% - 1/8W - Metal Film
LU-R118	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-182G	Resistor - 1.8K - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-242G	Resistor - 2.4K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 500	Resistor - Variable - 500
MODULE 5:		
LU-R57	RN92E-2B-430G	Resistor - 43 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
LU-R92	RJ-6S 50K	Resistor - Variable - 50K
LU-R93	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 10K	Resistor - Variable - 10K
LU-R95	RN92E-2B-183G	Resistor - 18K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 5K	Resistor - Variable - 5K

Ref. No.	Part No.	Description
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2B-433F	Resistor - 43K - ± 1% - 1/8W - Metal Film
LU-R116	RJ-6S 5K	Resistor - Variable - 5K
LU-R117	RN92E-2B-122F	Resistor - 1.2K - ± 1% - 1/8W - Metal Film
LU-R118	RN92E-2B-220G	Resistor - 22 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-181G	Resistor - 180 - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-333G	Resistor - 33K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 10K	Resistor - Variable - 10K
MODULE 6:		
LU-R57	RN92E-2B-390G	Resistor - 39 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2E-104G	Resistor - 100K - ± 2%- 1/4W - Metal Film
LU-R92	RJ-6S 50K	Resistor - Variable - 50K
LU-R93	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 10K	Resistor - Variable - 10K
LU-R95	RN92E-2B-223G	Resistor - 22K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 5K	Resistor - Variable - 5K
LU-R101	NOT REQUIRED	
LU-R102	NOT REQUIRED	
LU-R103	NOT REQUIRED	
LU-R113	NOT REQUIRED	
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2B-433F	Resistor - 43K - ± 1% - 1/8W - Metal Film
LU-R116	RJ-6S 5K	Resistor - Variable - 5K
LU-R117	RN92E-2B-122F	Resistor - 1.2K - ± 1% - 1/8W - Metal Film
LU-R118	RN92E-2B-270G	Resistor - 27 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-241G	Resistor - 240 - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-303G	Resistor - 30K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 10K	Resistor - Variable - 10K
MODULE 7:		
LU-R57	RN92E-2B-430G	Resistor - 43 - ± 2% - 1/8W - Metal Film
LU-R91	RN92E-2E-114G	Resistor - 110K - ± 2% - 1/4W - Metal Film
LU-R92	RJ-6S 20K	Resistor - Variable-20K
LU-R93	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
LU-R94	RJ-6S 10K	Resistor - Variable - 10K
LU-R95	RN92E-2B-163G	Resistor - 16K - ± 2% - 1/8W - Metal Film
LU-R96	RJ-6S 5K	Resistor - Variable - 5K
LU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
LU-R102	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R103	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
LU-R113	RN92E-2E-224G	Resistor - 220K - ± 2% - 1/4W - Metal Film

Ref. No.	Part No.	Description
LU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
LU-R115	RN92E-2B-563F	Resistor - 56K - ± 1% - 1/8W - Metal Film
LU-R116	RJ-6S 5K	Resistor - Variable - 5K
LU-R117	RN92E-2B-182F	Resistor - 1.8K - ± 1% - 1/8W - Metal Film
LU-R118	RN92E-2B-750G	Resistor - 75 - ± 2% - 1/8W - Metal Film
LU-R119	RN92E-2B-621G	Resistor - 620 - ± 2% - 1/8W - Metal Film
LU-R120	RN92E-2B-302G	Resistor - 3K - ± 2% - 1/8W - Metal Film
LU-R121	RJ-6S 500	Resistor - Variable - 500

Table 9.17.2 LU MODULE 1, 2, 3, 4, 5, 6 & 7 Amplifier Parts List

(Note) *marked parts are not needed in MODULE 1

Ref. No.	Part No.	Description
LU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
LU-R2	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
LU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
LU-R5	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
LU-R6	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
LU-R7	NAF 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
LU-R8	NAF 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
LU-R10	RGP103 5K	Resistor - Variable - 5K
LU-R12	HES 1/2J 2M	Resistor - 2M - ± 5% - 1/2W - Carbon Film
LU-R13	NAF 1/4J 150K	Resistor - 150K - ± 5% - 1/4W - Carbon Film
LU-R15	NAF 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
LU-R16	NAF 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
LU-R17	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
LU-R18	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
LU-R21	NAF 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
LU-R22	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
LU-R23	Jumper	
LU-R24	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
LU-R25	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
LU-R26	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
LU-R27	HES 1/2J 2M	Resistor - 2M - ± 5% - 1/2W - Carbon Film
LU-R28	NAF 1/4J 150	Resistor - 150 - ± 5% - 1/4W - Carbon Film
LU-R29	NAF 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
LU-R30	NAF 1/4J 3.3K	Resistor - 3.3K - ± 5% - 1/4W - Carbon Film
LU-R31	NAF 1/4J 3K	Resistor - 3K - ± 5% - 1/4W - Carbon Film
LU-R32	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R33	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
LU-R34	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
LU-R35	NAF 1/4J 15K	Resistor - 15K ± 5% - 1/4W - Carbon Film
LU-R37	Jumper	
LU-R39	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
LU-R40	λ-13S 2K	Resistor - Variable - 2K
LU-R41	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
LU-R42	RGP103 20K	Resistor - Variable - 20K
LU-R43	NAS 1/4J 1M	Resistor - 1M - ± 5% - 1/4W - Carbon Film
LU-R44	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
LU-R45	RN92E-2E-104G	Resistor - 100K ± 2% - 1/4W - Metal Film
LU-R46	RN92E-2B-163G	Resistor - 16K - ± 2% - 1/8W - Metal Film
LU-R47	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
LU-R48	NAS 1/4J 1M	Resistor - 1M - ± 5% - 1/4W - Carbon Film
LU-R49	Jumper	
LU-R50	RGP103 100K	Resistor - Variable - 100 K
LU-R51	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film

Ref. No.	Part No.	Description
LU-R52	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
LU-R53	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R54	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R55	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
LU-R56	RJ-13S 20K	Resistor - Variable - 20K
LU-R57	Refer to Table 9.17.1.	
LU-R58	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
LU-R59	RN92E-2B-153G	Resistor - 15K - ± 2% - 1/8W - Metal Film
LU-R60	RJ-6S 5K	Resistor - Variable - 5K
LU-R61	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R62	RJ-6S 10K	Resistor - Variable - 10K
LU-R63	RN92E-2B-513G	Resistor - 51K - ± 2% - 1/8W - Metal Film
LU-R64	NAF 1/4J 27K	Resistor - 27K - ± 5% - 1/4W - Carbon Film
LU-R65	RN92E-2B-563G	Resistor - 56K - ± 2% - 1/8W - Metal Film
LU-R66	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R69	NAF 1/4J 6.8K	Resistor - 6.8K - ± 5% - 1/4W - Carbon Film
LU-R70	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
LU-R71	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
LU-R72	NAF 1/4J 2.2K	Resistor - 2.2K - ± 5% - 1/4W - Carbon Film
LU-R73	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
LU-R74	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
LU-R75	NAF 1/4J 22K	Resistor - 22K - ± 5% - 1/4W - Carbon Film
LU-R76	NAF 1/4J 1.2K	Resistor - 1.2K - ± 5% - 1/4W - Carbon Film
LU-R77	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
LU-R78	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
LU-R79	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
LU-R91		
〜	Refer to Table 9.17.1.	
LU-R96		
LU-R100	Jumper	
LU-R101	Refer to Table 9.17. 1.	
LU-R102	Refer to Table 9.17.1	
LU-R103	Refer to Table 9.17.1.	
LU-R113		
〜	Refer to Table 9.17.1.	
LU-R121		
LU-R124	Jumper	
LU-R125	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
LU-R126	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
*LU-R127	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
LU-C1	DEP (J) 0.068MF	Capacitor - 0.068 μF - ± 5% - 50V - Polyester
LU-C2	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
LU-C3	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
LU-C4	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
LU-C5	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester

Ref. No.	Part No.	Description
LU-C6	DEP (M) 0.0022MF	Capacitor - 0.0022 μF - ± 20% - 50V - Polyester
LU-C7	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
LU-C8	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
LU-C9	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
LU-C10	25U 4.7 B.P.	Capacitor - 4.7 μF - $^{+75}_{-10}$ % - 25V - Electrolytic
LU-C11	DD104CH100D	Capacitor - 10 pF - ± 5% - 50V - Ceramic
LU-C12	RT-16-MM-47	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
LU-C13	RT-16-MM-47	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
LU-C14	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
LU-C15	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
LU-C16	196D474X0035HA1	Capacitor - 0.47 μF - ± 20% - 35V - Tantalum
LU-C17	196D474X0035HA1	Capacitor - 0.47 μF - ± 20 % - 35V - Tantalum
LU-C18	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-10}$% - 50V - Ceramic
LU-C19	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-10}$% - 50V - Ceramic
LU-C23	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
LU-C24	10U 47 B.P.	Capacitor - 47 μF - $^{+75}_{-10}$% - 10V - Electrolytic
*LU-C31	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
LU-C33	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
LU-C34	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
LU-C35	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
LU-C36	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
LU-C37	50U 1	Capacitor - 1 μF - $^{+75}_{-10}$% - 50V - Electrolytic
LU-C38	50U 1	Capacitor - 1 μF - $^{+75}_{-10}$% - 50V - Electrolytic
LU-C41	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
LU-C42	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
*LU-C43	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-20}$% - 50V - Ceramic
*LU-C44	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-20}$% - 50V - Ceramic
LU-C45	DD104B101K	Capacitor - 100 pF - ± 10% - 50V - Ceramic
LU-C46	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
LU-S1	02BZ3.3	Zener Diode
LU-S2	2SK18Y	Field-Effect Transistor
LU-S3	MC14093BCP	Integrated Circuit
LU-S4	2SC1344E	Transistor
LU-S5	2SC1344E	Transistor
LU-S6	LM301AN	Integrated Circuit
LU-S7	2SK30A GR	Field-Effect Transistor
LU-S8	TL082CP	Integrated Circuit
LU-S9	PC-507	Opto Coupled Isolator
LU-S10	TL082CP	Integrated Circuit
LU-S11	LM329BZ	Zener Diode
LU-S12	LM329BZ	Zener Diode
LU-S13	TL082CP	Integrated Circuit
LU-S14	1S1588	Diode
LU-S15	2SC1815Y	Transistor
LU-S16	1S1588	Diode

Ref. No.	Part No.	Description
LU-S17	2SA1015Y	Transistor
LU-S18	TL082CP	Integrated Circuit
LU-S19	2SC1815Y	Transistor
LU-S20	2SC1815Y	Transistor
LU-S21	2SA1015Y	Transistor
LU-S22	2SA1015Y	Transistor
LU-S23	1S1588	Diode
LU-S24	1S1588	Diode
LU-S25	1S1588	Diode
LU-S26	2SC1815Y	Transistor
LU-S27	2SA1015Y	Transistor
LU-S28	1S1588	Diode
LU-S31	2SC1815Y	Transistor
LU-S32	2SB434Y	Transistor
LU-S33	2SA1015Y	Transistor
LU-S34	2SD880Y	Transistor
*LU-S43	LM301P	Integrated Circuit
LU-S44	W02	Rectifier
LU-S45	W02	Rectifier
LU-S46	LM340T15	Integrated Circuit
LU-S47	MC7915CT	Integrated Circuit
LU-S48	10D2	Diode
LU-S49	10D2	Diode
LU-L1	FT-18D	Choke
*LU-J1	IL-3P-S3EN2	Connector - Receptacle - 3 Pin
LU-PB1	LR-343	Amp. P.C. Board Assembly

Table 9.18 MU MODULE 1 (Linearized) Attenuator Parts List

Ref. No.	Part No.	Description
MU-R1	RJ-13B 5K	Resistor - Variable - 5K
MU-R2	RN92E-2B-100G	Resistor - 10 - ± 2% - 1/8W - Metal Film
MU-SW1	RS-700BE 1-3-3	Rotary Switch
MU-SW2	M-2020	Toggle Switch
MU-J101	317-12-901-01	Type 2 Terminal - Red
MU-J102	317-12-901-02	Type 2 Terminal - Black
MU-PB1	LR-343	AMP P.C. Board Assembly
MU-PB2	BI-384	Bias Circuit P.C. Board Assembly

Table 9.19 NU MODULE 1 (Linearized) Bias Circuit Parts List

Ref. No.	Part No.	Description
NU-R1	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
NU-R2	RJ-6P 10K	Resistor - Variable - 10K
NU-R3	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
NU-R10	Jumper	
NU-R13	Jumper	
NU-R14	RN92E-2B-432G	Resistor - 4.3K - ± 2% - 1/8W - Metal Film
NU-C1	DD105 CH330J	Capacitor - 33pF -± 5% - 50V - Ceramic
NU-S1	LM301AM	Integrated Circuit
NU-J1	IL-10P-S3EN2	Connector - Receptacle - 10pin
NU-PB2	BI-384	Bias Circuit P.C. Board Assembly

Table 9.20 OU MODULE 2, 3, 4, 5, 6 & 7 (Linearized) Attenuator Parts List

Ref. No.	Part No.	Description
OU-R1	RJ-13B 5K	Resistor - Variable - 5K
OU-R2	RN92E-2B-100G	Resistor - 10 - ±2% - 1/8W - Metal Film
OU-R3	Incorporated in OU-J1	
OU-SW1	RS-700BE 1-3-3	Rotary Switch
OU-SW2	M-2020	Toggle Switch
OU-SW3	MFS-201	Slide Switch
OU-J1	757-90-002	Input Terminal For Thermocouple (OU-R3, 240 Ω at 0°C × 2 is incorporated.)
OU-PB1	LR-343	AMP P.C. Board Assembly

Table 9.21.1 PU MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier Component Variation List

Ref. No.	Part No.	Description
MODULE 1 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2B-513G	Resistor - 51K - ± 2% - 1/8W - Metal Film
PU-R90	RN92E-2B-112G	Resistor - 1.1K - ± 2% - 1/8W - Metal Film
PU-R91	Jumper	
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-223G	Resistor - 22K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R96	RJ-6S 20K	Resistor - Variable - 20K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	RN92E-2E-164G	Resistor - 160K - ± 2% - 1/4W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2B-683G	Resistor - 68K - ± 2% - 1/8W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2B-683G	Resistor - 68K - ± 2% - 1/8W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	NOT REQUIRED	
PU-R115	NOT REQUIRED	
PU-R116	NOT REQUIRED	
PU-R117	NOT REQUIRED	
PU-R118	NOT REQUIRED	
PU-R119	NOT REQUIRED	
PU-R120	NOT REQUIRED	
PU-R121	NOT REQUIRED	
PU-R57	RN92E-2B-150G	Resistor - 15 - ± 2% - 1/4W - Metal Film
MODULE 2 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-274G	Resistor - 270K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-112G	Resistor - 1.1K - ± 2% - 1/8W - Metal Film
PU-R91	RN92E-2B-221G	Resistor - 220 - ± 2% - 1/8W - Metal Film
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-123G	Resistor - 12K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-363G	Resistor - 36K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 10K	Resistor - Variable - 10K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
PU-R100	RN92E-2B-153G	Resistor - 15K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2E-104F	Resistor - 100K - ± 1% - 1/4W - Metal Film
PU-R116	RJ-6S 10K	Resistor - Variable - 10K
PU-R117	RN92E-2B-332F	Resistor - 3.3K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-820G	Resistor - 82 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-102G	Resistor - 1K - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-242G	Resistor - 2.4K - ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 500	Resistor - Variable - 500
PU-R57	RN92E-2B-161G	Resistor - 160 - ± 2% - 1/8W - Metal Film
MODULE 3 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-434G	Resistor - 430K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-122G	Resistor - 1.2K - ± 2% - 1/8W - Metal Film
PU-R91	RN92E-2B-151G	Resistor - 150 - ± 2% - 1/8W - Metal Film
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-113G	Resistor - 11K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-333G	Resistor - 33K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 10K	Resistor - Variable - 10K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	EN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2B-753F	Resistor - 75K - ± 1% - 1/8W - Metal Film

Ref. No.	Part No.	Description
PU-R116	RJ-6S 5K	Resistor - Variable - 5K
PU-R117	RN92E-2B-332F	Resistor - 3.3K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-162G	Resistor - 1.6K - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-182G	Resistor - 1.8K - ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 500	Resistor - Variable - 500
PU-R57	RN92E-2B-131G	Resistor - 130 - ± 2% - 1/8W - Metal Film
MODULE 4 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-624G	Resistor - 620K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-182G	Resistor - 1.8K - ± 2% - 1/8W - Metal Film
PU-R91	Jumper	
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-113G	Resistor - 11K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-203G	Resistor - 20K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 5K	Resistor - Variable - 5K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	RN92E-2B-183G	Resistor - 18K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2E-823F	Resistor - 82K - ± 1% - 1/4W - Metal Film
PU-R116	RJ-6S 5K	Resistor - Variable - 5K
PU-R117	RN92E-2B-362F	Resistor - 3.6K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-182G	Resistor - 1.8K - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-242G	Resistor - 2.4K - ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 500	Resistor - Variable - 500
PU-R57	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
MODULE 5 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-124G	Resistor - 120K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-821G	Resistor - 820 - ± 2% - 1/8W - Metal Film
PU-R91	RN92E-2B-331G	Resistor - 330 - ± 2% - 1/8W - Metal Film
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-153G	Resistor - 15K - ± 2% - 1/8W - Metal Film

Ref. No.	Part No.	Description
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 10K	Resistor - Variable - 10K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E-823G	Resistor - 82K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable -20K
PU-R109	RN92E-2E-823G	Resistor - 82K - ± 2% - 1/4W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2B-433F	Resistor - 43K - ± 1% - 1/8W - Metal Film
PU-R116	RJ-6S 5K	Resistor - Variable - 5K
PU-R117	RN92E-2B-122F	Resistor - 1.2 K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-220G	Resistor - 22 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-181G	Resistor - 180 - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-333G	Resistor - 33K- ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 10K	Resistor - Variable - 10K
PU-R57	RN92E-2B-430G	Resistor - 43 - ± 2% - 1/8W - Metal Film
MODULE 6 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-154G	Resistor - 150K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-911G	Resistor - 910 - ± 2% - 1/8W - Metal Film
PU-R91	Jumper	
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-123G	Resistor - 12K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 10K	Resistor - Variable - 10K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	RN92E-2B-513G	Resistor - 51K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R104	RN92 E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film

Ref. No.	Part No.	Description
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2B-433F	Resistor - 43K - ± 1% - 1/8W - Metal Film
PU-R116	RJ-6S 5K	Resistor - Variable - 5K
PU-R117	RN92E-2B-122F	Resistor - 1.2K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-270G	Resistor - 27 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-241G	Resistor - 240 - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-303G	Resistor - 30K - ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 10K	Resistor - Variable - 10K
PU-R57	RN92E-2B-390G	Resistor - 39 - ± 2% - 1/8W - Metal Film
MODULE 7 (Linearized):		
PU-R88	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R89	RN92E-2E-184G	Resistor - 180K - ± 2% - 1/4W - Metal Film
PU-R90	RN92E-2B-751G	Resistor - 750- ± 2% - 1/8W - Metal Film
PU-R91	RN92E-2B-111G	Resistor - 110 - ± 2% - 1/8W - Metal Film
PU-R92	RJ-6S 2K	Resistor - Variable - 2K
PU-R93	RN92E-2B-183G	Resistor - 18K - ± 2% - 1/8W - Metal Film
PU-R94	RJ-6S 5K	Resistor - Variable - 5K
PU-R95	RN92E-2B-513G	Resistor - 51K - ± 2% - 1/8W - Metal Film
PU-R96	RJ-6S 10K	Resistor - Variable - 10K
PU-R99	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R100	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
PU-R101	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R102	RJ-6S 20K	Resistor - Variable - 20K
PU-R103	RN92E-2B-683G	Resistor - 68K - ± 2% - 1/8W - Metal Film
PU-R104	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R105	RJ-6S 20K	Resistor - Variable - 20K
PU-R106	RN92E-2E0913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R107	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R108	RJ-6S 20K	Resistor - Variable - 20K
PU-R109	RN92E-2E-913G	Resistor - 91K - ± 2% - 1/4W - Metal Film
PU-R113	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R114	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
PU-R115	RN92E-2B-563F	Resistor - 56K - ± 1% - 1/8W - Metal Film
PU-R116	RJ-6S 5K	Resistor - Variable - 5K
PU-R117	RN92E-2B-182F	Resistor - 1.8K - ± 1% - 1/8W - Metal Film
PU-R118	RN92E-2B-750G	Resistor - 75 - ± 2% - 1/8W - Metal Film
PU-R119	RN92E-2B-621G	Resistor - 620 - ± 2% - 1/8W - Metal Film
PU-R120	RN92E-2B-302G	Resistor - 3K - ± 2% - 1/8W - Metal Film
PU-R121	RJ-6S 500	Resistor - Variable - 500
PU-R57	RN92E-2B-430G	Resistor - 43 - ± 2% - 1/8W - Metal Film

Table 9.21.2 PU MODULE 1, 2, 3, 4, 5, 6 & 7 (Linearized) Amplifier Parts List

(Note) * marked parts are not needed in MODULE 1.

Ref. No.	Part No.	Description
PU-R1	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
PU-R2	RE35YQ-10KF	Resistor - 10K - ± 1% - 1/4W - Metal Film
PU-R4	RN92E-2B-201G	Resistor - 200 - ± 2% - 1/8W - Metal Film
PU-R13	NAF 1/4J 150K	Resistor - 150K - ± 5% - 1/4W - Carbon Film
PU-R15	NAF 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
PU-R16	NAF 1/4J 220K	Resistor - 220K - ± 5% - 1/4W - Carbon Film
PU-R17	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
PU-R18	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
PU-R21	NAF 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
PU-R22	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
PU-R23	Jumper	
PU-R24	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
PU-R25	RE35YQ-100KF	Resistor - 100K - ± 1% - 1/4W - Metal Film
PU-R26	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
PU-R27	HES 1/2J 2M	Resistor - 2M - ± 5% - 1/2W - Carbon Film
PU-R28	NAF 1/4J 150	Resistor - 150 - ± 5% - 1/4W - Carbon Film
PU-R29	NAF 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
PU-R30	NAF 1/4J 3.3K	Resistor - 3.3K - ± 5% - 1/4W - Carbon Film
PU-R31	NAF 1/4J 3K	Resistor - 3K - ± 5% - 1/4W - Carbon Film
PU-R32	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R33	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
PU-R34	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
PU-R35	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
PU-R37	Jumper	
PU-R39	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
PU-R40	λ-13S 10K	Resistor - Variable - 10K
PU-R41	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
PU-R42	RGP-103 20K	Resistor -Variable - 20K
PU-R43	NAS 1/4J 1M	Resistor - 1M - ± 5% - 1/4W - Carbon Film
PU-R44	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
PU-R45	RN92E-2E-104G	Resistor - 100K - ± 2% - 1/4W - Metal Film
PU-R46	RN92E-2B-163G	Resistor - 16K - ± 2% - 1/8W - Metal Film
PU-R47	RN92E-2B-433G	Resistor - 43K - ± 2% - 1/8W - Metal Film
PU-R48	NAS 1/4J 1M	Resistor - 1M - ± 5% - 1/4W - Carbon Film
PU-R49	Jumper	
PU-R50	RGP-103 100K	Resistor - Variable - 100K
PU-R51	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R52	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
PU-R53	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R54	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R55	RN92E-2B-753G	Resistor - 75K - ± 2% - 1/8W - Metal Film
PU-R56	RJ-13S 20K	Resistor - Variable - 20K

Ref. No.	Part No.	Description
PU-R57	Refer to Table 9.21.1.	
PU-R58	RN92E-2B-393G	Resistor - 39K - ± 2% - 1/8W - Metal Film
PU-R59	RN92E-2B-153G	Resistor - 15K - ± 2% - 1/8W - Metal Film
PU-R60	RJ-6S 5K	Resistor - Variable - 5K
PU-R61	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R62	RJ-6S 10K	Resistor - Variable - 10K
PU-R63	RN92E-2B-513G	Resistor - 51K - ± 2% - 1/8W - Metal Film
PU-R64	NAF 1/4J 27K	Resistor - 27K - ± 5% - 1/4W - Carbon Film
PU-R65	RN92E-2B-563G	Resistor - 56K - ± 2% - 1/8W - Metal Film
PU-R66	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R69	NAF 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
PU-R70	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
PU-R71	HES 1/2J 3M	Resistor - 3M - ± 5% - 1/2W - Carbon Film
PU-R72	NAF 1/4J 2.2K	Resistor - 2.2K - ± 5% - 1/4W - Carbon Film
PU-R73	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
PU-R74	NAF 1/4J 100K	Resistor - 100K - ± 5% - 1/4W - Carbon Film
PU-R75	NAF 1/4J 22K	Resistor - 22K - ± 5% - 1/4W - Carbon Film
PU-R76	NAS 1/4J 1.2K	Resistor - 1.2K - ± 5% - 1/4W - Carbon Film
PU-R77	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
PU-R78	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
PU-R79	NAF 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
PU-R80	NAF 1/4J 75K	Resistor - 75K - ± 5% - 1/4W - Carbon Film
PU-R81	Jumper	
PU-R82	NAF 1/4J 47K	Resistor - 47K - ± 5% - 1/4W - Carbon Film
PU-R83	NAF 1/4J 47K	Resistor - 47K - ± 5% - 1/4W - Carbon Film
PU-R84	NAF 1/4J 47K	Resistor - 47K - ± 5% - 1/4W - Carbon Film
PU-R85	NAF 1/4J 47K	Resistor - 47K - ± 5% - 1/4W - Carbon Film
PU-R86	NAF 1/4J 3.9K	Resistor - 3.9K - ± 5% - 1/4W - Carbon Film
PU-R87	NAF 1/4J 3K	Resistor - 3K - ± 5% - 1/4W - Carbon Film
PU-R88		
≀	Refer to Table 9.21.1	
PU-R96		
PU-R99		
≀	Refer to Table 9.21.1.	
PU-R109		
PU-R113		
≀	Refer to Table 9.21.1	
PU-R121		
PU-R125	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
PU-R126	NAF 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
*PU-R127	NAF 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
PU-C1	DEP (J) 0.068MF	Capacitor - 0.068 μF - ± 5% - 50V - Polyester
PU-C2	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
PU-C3	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
PU-C4	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum

Ref. No.	Part No.	Description
PU-C5	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester
PU-C6	DEP (M) 2200PF	Capacitor - 2200 p F - ± 20% - 50V - Polyester
PU-C7	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
PU-C8	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
PU-C9	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
PU-C10	CE04W 4.7 B.P.	Capacitor - 4.7 μF - $^{+100}_{-10}$% - 25V - Electrolytic
PU-C11	DD104CH100J	Capacitor - 10 p F - ± 5% - 50V - Ceramic
PU-C12	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
PU-C13	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
PU-C14	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
PU-C15	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Polyester
PU-C16	196D474X0035HA1	Capacitor - 0.47 μF - ± 20% - 35V - Tantalum
PU-C17	196D474X0035HA1	Capacitor - 0.47 μF - ± 20% - 35V - Tantalum
PU-C18	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-20}$% - 50V - Ceramic
PU-C19	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-20}$% - 50V - Ceramic
PU-C23	DEP (M) 0.015MF	Capacitor - 0.015 μF - ± 20% - 50V - Polyester
PU-C24	CE04W 47 B.P.	Capacitor - 47 μF - $^{+75}_{-10}$% - 10V - Electrolytic
PU-C25	DD104B101K	Capacitor - 100 p F - ± 10% - 50V - Ceramic
PU-C26	DD104CH100D	Capacitor - 10 p F - ± 5% - 50V - Ceramic
PU-C27	DD104B102K	Capacitor - 1000 p F - ± 10% - 50V - Ceramic
PU-C28	CE04W 1MF	Capacitor - 1 μF - $^{+75}_{-10}$% - 50V - Electrolytic
PU-C29	DD104B102K	Capacitor - 1000 p F - ± 10% - 50V - Ceramic
PU-C30	DD104B102K	Capacitor - 1000 p F - ± 10% - 50V - Ceramic
*PU-C31	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
PU-C33	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
PU-C34	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
PU-C35	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
PU-C36	RT-25-MM-471	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
PU-C37	CE04W 1MF	Capacitor - 1 μF - $^{+75}_{-10}$% - 50V - Electrolytic
PU-C38	CE04W 1MF	Capacitor - 1 μF - $^{+75}_{-10}$% - 50V - Electrolytic
PU-C39	ECS-Z35HS1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
PU-C40	ECS-Z35HS1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
PU-C41	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
PU-C42	RT-16-MM-470	Capacitor - 47 μF - $^{+50}_{-10}$% - 16V - Electrolytic
*PU-C43	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-20}$% - 50V - Ceramic
*PU-C44	DD107F103Z	Capacitor - 0.01 μF - $^{+80}_{-10}$% - 50V - Ceramic
PU-C45	DD104B101K	Capacitor - 100 p F - ± 10% - 50V - Ceramic
PU-C46	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
PU-S1	02BZ3.3	Zener Diode
PU-S2	2SK18Y	Field-Effect Tansistor
PU-S3	MC14093BCP	Integrated Circuit
PU-S4	2SC1344E	Transistor
PU-S5	2SC1344E	Transistor
PU-S6	LM301AN	Integrated Circuit
PU-S7	2SK30A GR	Field-Effect Transistor

Ref. No.	Part No.	Description
PU-S8	TL082CP	Integrated Circuit
PU-S9	PC507	Opto Coupled Isolator
PU-S10	TL082CP	Integrated Circuit
PU-S11	LM329BZ	Zener Diode
PU-S12	LM329BZ	Zener Diode
PU-S13	TL082CP	Integrated Circuit
PU-S14	1S1588	Diode
PU-S15	2SC1815Y	Transistor
PU-S16	1S1588	Diode
PU-S17	2SA1015Y	Transistor
PU-S18	TL082CP	Integrated Circuit
PU-S19	2SC1815Y	Transistor
PU-S20	2SC1815Y	Transistor
PU-S21	2SA1015Y	Transistor
PU-S22	2SA1015Y	Transistor
PU-S23	1S1588	Diode
PU-S24	1S1588	Diode
PU-S25	1S1588	Diode
PU-S26	2SC1815Y	Transistor
PU-S27	2SA1015Y	Transistor
PU-S28	1S1588	Diode
PU-S31	2SC1815Y	Transistor
PU-S32	2SB434Y	Transistor
PU-S33	2SA1015Y	Transistor
PU-S34	2SD880Y	Transistor
PU-S35	AD7574 JN	Integrated Circuit, With Socket
PU-S36	2716	Integrated Circuit, With Socket
PU-S37	AD7524 JN	Integrated Circuit, With Socket
PU-S38	SD-101	Schottky-Barrier Diode
PU-S39	TL082CP	Integrated Circuit
PU-S40	1S1588	Diode
PU-S41	SN74LS00N	Integrated Circuit
PU-S42	SN74LS221N	Integrated Circuit
*PU-S43	LM301P	Integrated Circuit
PU-S44	W02	Rectifier
PU-S45	W02	Rectifier
PU-S46	LM340T15	Integrated Circuit
PU-S47	MC7915CT	Integrated Circuit
PU-S48	10D2	Diode
PU-S49	10D2	Diode
PU-S50	7805 (TO-220)	Integrated Circuit
PU-L1	FT-18D	Choke
PU-J1	IL-3P-S3EN2	Connector-Receptacle - 3 pin
PU-PB1	LR-343	AMP P.C. Board Assembly

Table 9.22 AO Chart Take-up Parts List

Ref. No.	Part No.	Description
AO-C1	PMAP 0.01MF5y	Capacitor - 0.01μF - ±20% - 630V - Paper
AO-C2	MP 0.6 + 0.2MF	Capacitor - 0.6μF + 0.2μF - ±20% - 250V - Metalized Paper
AO-M1	P-301	Servo Motor
AO-SW1	S1	Slide Switch
AO-J1	1625-3R	Connector-Socket - 3 pin - Unfixed
	1625-3P-1	Connector-Plug - 3 pin - Unfixed

Table 9.23 BO_1 OPTION 2 Event Marker Parts List, 1241-2

Ref. No.	Part No.	Description
BO_1-J1	SI-7403	Connector-Socket - 2 Pin - Unfixed
	SI-7510	Connector-Plug - 2 Pin - Unfixed
BO_1-J6	IL-10P-S3FP2	Connector-Receptacle - 10 Pin
	IL-10S-S3L	Connector-Plug - 10 Pin
BO_1-J8	IL-3P-S3FP2	Connector-Receptacle - 3 Pin
	IL-3S-S3L	Connector-Plug - 3 Pin
BO_1-J101	57-40240	Connector-Receptacle - 24 Pin
BO_1-M1	MD-161-2	Solenoid
BO_1-PB1	RM-385	TTL Interface Board Assembly
BO_1-R1	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
BO_1-R5	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
BO_1-R6	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
BO_1-R7	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
BO_1-C2	DEP (M) 0.047MF	Capacitor - 0.047 μF - 20% - 50V - Polyester
BO_1-S1	05Z5.1X	Zener Diode
BO_1-S7	1S1588	Diode
BO_1-S8	1S1588	Diode
BO_1-S9	1S1588	Diode
BO_1-S10	2SC1815Y	Transistor
BO_1-S11	2SC495Y	Transistor
BO_1-R33	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
BO_1-R34	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
BO_1-R35	SQP7W 70	Resistor - 70 - ± 10% - 7W - Wire Wound
BO_1-C15	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$% - 25V - Electrolytic
BO_1-C16	CE04W 470MF	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
BO_1-S32	1S1588	Diode
BO_1-S33	2SA505	Transistor
BO_1-S34	10D2	Diode
BO_1-S35	10D2	Diode
BO_1-S36	10D2	Diode

Table 9.24 BO_2 OPTION 2 Event Marker Parts List, 1243

Ref. No.	Part No.	Description
BO_2-J1	SI-7403	Connector-Socket - 2 Pin - Unfixed
	SI-7510	Connector-Plug - 2 Pin - Unfixed
BO_2-J8	IL-10P-S3FP2	Connector-Receptacle - 10 Pin
	IL-10S-S3L	Connector-Plug - 10 Pin
BO_2-J10	IL-3P-S3FP2	Connector-Receptacle - 3 Pin
	IL-3S-S3L	Connector-Plug - 3 Pin
BO_2-J101	57-40240	Connector-Receptacle - 24 Pin
BO_2-M1	MD-161-2	Solenoid
BO_2-PB1	RM-385	TTL Interface Board Assembly
BO_2-R1	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
BO_2-R5	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
BO_2-R6	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
BO_2-R7	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
BO_2-C2	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester
BO_2-S1	05Z5.1X	Zener Diode
BO_2-S7	1S1588	Diode
BO_2-S8	1S1588	Diode
BO_2-S9	1S1588	Diode
BO_2-S10	2SC1815Y	Transistor
BO_2-S11	2SC495Y	Transistor
BO_2-R33	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
BO_2-R34	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
BO_2-R35	SQP7W 70	Resistor - 70 - ± 10% - 7W - Carbon Film
BO_2-C16	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$% - 25V - Electrolytic
BO_2-C18	CE04W 470MF	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
BO_2-C32	1S1588	Diode
BO_2-S33	2SA505	Transistor
BO_2-S34	10D2	Diode
BO_2-S38	10D2	Diode
BO_2-S39	10D2	Diode

Table 9.25 CO OPTION 3 Electric Pen Lift Parts List

(Note) Items having * mark are for Model 1242.

Ref. No.	Part No.	Description
CO-J1	SI-7403	Connector-Socket - 2 Pin - Unfixed
	SI-7510	Connector-Plug - 2 Pin - Unfixed
*CO-J2	SI-7403	Connector-Socket - 2 Pin - Unfixed
	SI-7510	Connector-Plug - 2 Pin - Unfixed
CO-J6	IL-10P-S3FP2	Connector-Receptacle - 10 Pin
	IL-10S-S3L	Connector-Plug - 10 Pin
CO-J7	IL-3P-S3FP2	Connector-Receptacle - 3 Pin
	IL-3S-S3L	Connector-Plug - 3 Pin
*CO-J8	IL-3P-S3FP2	Connector-Receptacle - 3 Pin
	IL-3S-S3L	Connector-Plug - 3 Pin
CO-J101	57-40240	Connector-Receptacle - 24 Pin
CO-M1	MD-161-2	Solenoid
*CO-M2	MD-161-2	Solenoid
CO-PB1	RM-385	TTL Interface Board Assembly
CO-SW1	M-2012	Toggle Switch
*CO-SW2	M-2012	Toggle Switch
CO-R1	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
CO-R2	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
CO-R3	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
CO-R4	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
*CO-R5	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
*CO-R6	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
*CO-R7	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
CO-C1	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester
*CO-C2	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 50V - Polyester
CO-S1	05Z5.1X	Zener Diode
CO-S2	1S1588	Diode
CO-S3	1S1588	Diode
CO-S4	1S1588	Diode
CO-S5	2SC1815Y	Transistor
CO-S6	2SC495Y	Transistor
*CO-S7	1S1588	Diode
*CO-S8	1S1588	Diode
*CO-S9	1S1588	Diode
*CO-S10	2SC1815Y	Transistor
*CO-S11	2SC495Y	Transistor
CO-R30	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
CO-R31	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
CO-R32	SQP7W 70	Resistor - 70 - ± 10% - 7W - Wire Wound
*CO-R33	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
*CO-R34	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
*CO-R35	SQP7W 70	Resistor - 70 - ± 10% - 7W - Wire Wound
CO-C14	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$% - 25V - Electrolytic
*CO-C15	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$% - 25V - Electrolytic

Ref. No.	Part No.	Description
CO-C16	CE04W 470MF	Capacitor - 470 μF - $^{+50}_{-10}$% - 25V - Electrolytic
CO-S29	1S1588	Diode
CO-S30	2SA505	Transistor
CO-S31	10D2	Diode
*CO-S32	1S1588	Diode
*CO-S33	2SA505	Transistor
*CO-S34	10D2	Diode
CO-S35	10D2	Diode
CO-S36	10D2	Diode

Table 9.26 DO OPTION 4 Electric Pen Lift Parts List

Ref. No.	Part No.	Description
DO-J1	SI-7403	Connector-Socket - 2 Pin - Unfixed
	SI-7510	Connector-Plug - 2 Pin - Unfixed
DO-J8	IL-6P-S3FP2	Connector-Receptacle - 6 Pin
	IL-6S-S3L	Connector-Plug - 6 Pin
DO-J9	IL-3P-S3FP2	Connector-Receptacle - 3 Pin
	IL-3S-S3L	Connector-Plug - 3 Pin
DO-J101	57-40240	Connector-Receptacle - 24 Pin
DO-M1	MD-161-2	Solenoid
DO-PB1	RM-385	TTL Interface Board Assembly
DO-SW1	M-2012	Toggle Switch
DO-R1	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
DO-R2	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
DO-R3	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
DO-R4	NAS 1/4J 1.5K	Resistor - 1.5K - ± 5% - 1/4W - Carbon Film
DO-R5	NAS 1/4J 33K	Resistor - 33K - ± 5% - 1/4W - Carbon Film
DO-C1	DEP (M) 0.047MF	Capacitor - 0.047 μF - ± 20% - 1/4W - Polyester
DO-S1	05Z5.1X	Zener Diode
DO-S2	1S1588	Diode
DO-S3	1S1588	Diode
DO-S4	1S1588	Diode
DO-S5	2SC1815Y	Transistor
DO-S6	2SC495Y	Transistor
DO-R30	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
DO-R31	NAS 1/4J 470	Resistor - 470 - ± 5% - 1/4W - Carbon Film
DO-R32	SQP7W 70	Resistor - 70 - ± 10% - 7W - Wire Wound
DO-C15	CE04W 47MF	Capacitor - 47 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
DO-C18	CE04W 470MF	Capacitor - 470 μF - $^{+50}_{-10}$ % - 25V - Electrolytic
DO-S29	1S1588	Diode
DO-S30	2SA505	Transistor
DO-S31	10D2	Diode
DO-S38	10D2	Diode
DO-S39	10D2	Diode

Table 9-27 EO OPTION 5 Electronic Limit Switch Parts List

Ref. No.	Part No.	Description
EO-R2	Jumper	
EO-R4	Jumper	
EO-R5	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
EO-R6	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
EO-R7	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
EO-R8	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
EO-R12	Jumper	
EO-R14	Jumper	
EO-R15	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
EO-R16	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
EO-R17	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
EO-R18	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
EO-C2	DD105CH330J	Capacitor - 33pF - ± 5% - 50V - Ceramic
EO-S1	LM301AN	Integrated Circuit
EO-S2	1S1588	Diode
EO-S3	2SA1015Y	Transistor
EO-S5	LM301AN	Integrated Circuit
EO-S6	TLP532	Opto Coupled Isolator
EO-S11	LM301AN	Integrated Circuit
EO-S12	1S1588	Diode
EO-S13	2SC1815Y	Transistor
EO-S16	TLP532	Opto Coupled Isolator
EO-PB2	LS-274	Limit Switch Main Board Assembly
EO-J101	RM12BRD-4P	Connector-Receptacle - 4 Pin
EO-R41	λ-13TR 20K	Resistor-Variable - 20K
EO-R42	λ-13TR 20K	Resistor-Variable - 20K
EO-S41	MV-5024	L.E.D.
EO-S42	MV-5024	L.E.D.
EO-PB1	LS-275	Limit Switch Controls Board Assembly
EO-J203 (Note)	3250-018-098	Connector-Receptacle - 18 Pin
EO-J201	3250-018-098	AR-J201 connector for Channel 1 Input Module mounted on the Assembly No. MB-278 Motherboard.

Table 9.28 FO OPTION 6 Electronic Limit Switch Parts List

Ref. No.	Part No.	Description
FO-R2	Jumper	
FO-R4	Jumper	
FO-R5	NAS 1/4J 1K	Resistor - 1k - ± 5% - 1/4W - Carbon Film
FO-R6	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
FO-R7	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
FO-R8	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
FO-R12	Jumper	
FO-R14	Jumper	
FO-R15	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
FO-R16	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
FO-R17	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
FO-R18	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
FO-R22	Jumper	
FO-R24	Jumper	
FO-R25	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
FO-R26	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
FO-R27	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
FO-R28	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
FO-R32	Jumper	
FO-R34	Jumper	
FO-R35	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
FO-R36	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
FO-R37	NAS 1/4J 15K	Resistor - 15K - ± 5% - 1/4W - Carbon Film
FO-R38	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
FO-C2	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
FO-C22	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
FO-S1	LM301AN	Integrated Circuit
FO-S2	1S1588	Diode
FO-S3	2SA1015Y	Transistor
FO-S5	LM301AN	Integrated Circuit
FO-S6	TLP532	Opto Coupled Isolator
FO-S11	LM301AN	Integrated Circuit
FO-S12	1S1588	Diode
FO-S13	2SC1815Y	Transistor
FO-S16	TLP532	Opto Coupled Isolator
FO-S21	LM301AN	Integrated Circuit
FO-S22	1S1588	Diode
FO-S23	2SA1015Y	Transistor
FO-S25	LM301AN	Integrated Circuit
FO-S26	TLP532	Opto Coupled Isolator
FO-S31	LM301AN	Integrated Circuit
FO-S32	1S1588	Diode
FO-S33	2SC1815Y	Transistor

Ref. No.	Part No.	Description
FO-S36	TLP532	Opto Coupled Isolator
FO-PB2	LS-274	Limit Switch Main Board Assembly
FO-J101	RM12BRD-4P	Connector-Receptacle - 4 Pin
FO-J102	RM12BRD-4P	Connector - Receptacle - 4 Pin
FO-R41	λ-13TR 20K	Resistor-Variable - 20K
FO-R42	λ-13TR 20K	Resistor-Variable - 20K
FO-R43	λ-13TR 20K	Resistor-Variable - 20K
FO-R44	λ-13TR 20K	Resistor-Variable - 20K
FO-S41	MV-5024	L.E.D.
FO-S42	MV-5024	L.E.D.
FO-S43	MV-5024	L.E.D.
FO-S44	MV-5024	L.E.D.
FO-PB1	LS-275	Limit Switch Controls Board Assembly
FO-J203	3250-018-098	Connector-Receptacle - 18 Pin
(Notes)		
FO-J201	3250-018-098	AR-J201 connector for Channel 1 Input Module mounted on the Assembly No. MB-278 Motherboard.
FO-J202	3250-018-098	AR-J202 connector for Channel 2 Input Module mounted on the Assembly No. MB-278 Motherboard.

Table 9.29 GO OPTION 7 Electronic Limit Switch Parts List

Ref. No.	Part No.	Description
GO-R1	λ-13TR 20K	Resistor-Variable - 20K
GO-R2	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
GO-R3	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
GO-R4	NAS 1/4J 2.2K	Resistor - 2.2K - ± 5% - 1/4W - Carbon Film
GO-R5	λ-13TR 20K	Resistor-Variable - 20K
GO-R6	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
GO-R7	HES 1/2J 5.1M	Resistor - 5.1M - ± 5% - 1/2W - Carbon Film
GO-R8	NAS 1/4J 2.2K	Resistor - 2.2K - ± 5% - 1/4W - Carbon Film
GO-R9	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
GO-R10	NAS 1/4J 1.8K	Resistor - 1.8K - ± 5% - 1/4W - Carbon Film
GO-C1	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
GO-S1	LM301AN	Integrated Circuit
GO-S2	TL082CP	Integrated Circuit
GO-S3	1S1588	Diode
GO-S4	2SC1815Y	Transistor
GO-S5	TLP532	Opto Coupled Isolator
GO-S6	MV-5024	L.E.D.
GO-S7	1S1588	Diode
GO-S8	2SA1015Y	Transistor
GO-S9	TLP532	Opto Coupled Isolator
GO-S10	MV-5024	L.E.D.
GO-J103	RM12BRD-4P	Connector-Receptacle - 4 Pin
GO-PB1	LS-393	Limit Switch Board Assembly

Table 9.30 HO OPTION 10 Synchronizer Parts List

Ref. No.	Part No.	Description
HO-R1	λ-13S 2K	Resistor-Variable - 2K
HO-R2	λ-13S 5K	Resistor-Variable - 5K
HO-R3	RN92E-2B-453G	Resistor - 45K - ± 2% - 1/8W - Metal Film
HO-R4	NAS 1/4J 8.2K	Resistor - 8.2K - ± 5% - 1/4W - Carbon Film
HO-R5	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
HO-R6	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
HO-R7	NAS 1/4G 4.7K	Resistor - 4.7K - ± 2% - 1/4W - Carbon Film
HO-R8	NAS 1/4G 39K	Resistor - 39K - ± 2% - 1/4W - Carbon Film
HO-R9	NAS 1/4G 4.7K	Resistor - 4.7K - ± 2% - 1/4W - Carbon Film
HO-R10	NAS 1/4G 330	Resistor - 330 - ± 2% - 1/4W - Carbon Film
HO-R11	NAS 1/4G 4.7K	Resistor - 4.7K - ± 2% - 1/4W - Carbon Film
HO-R12	NAS 1/4G 4.7K	Resistor - 4.7K - ± 2% - 1/4W - Carbon Film
HO-R13	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R14	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R15	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R16	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R17	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R18	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R19	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R20	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R21	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R22	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R23	NAS 1/4G 10K	Resistor - 10K - ± 2% - 1/4W - Carbon Film
HO-R24	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
HO-R25	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
HO-R26	RN92E-2B-503G	Resistor - 50K - ± 2% - 1/8W - Metal Film
HO-R27	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
HO-R28	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
HO-R29	NAS 1/4J 8.2K	Resistor - 8.2K - ± 5% - 1/4W - Carbon Film
HO-R30	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
HO-C1	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
HO-C2	196D105X0035HA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
HO-C3	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
HO-C4	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
HO-C5	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
HO-C6	DEP (M) 0.22MF	Capacitor - 0.22 μF - ± 20% - 50V - Ceramic
HO-C7	DD104B102K	Capacitor - 1000 pF - ± 10% - 50V - Ceramic
HO-C8	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
HO-C9	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
HO-C10	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
HO-C11	DD104B102K	Capacitor - 1000 pF - ± 10% - 50V - Ceramic
HO-C12	DD105CG330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
HO-C13	DD104B101K	Capacitor - 100 pF - ± 10% - 50V - Ceramic

Ref. No.	Part No.	Description
HO-C14	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
HO-C15	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
HO-C16	196D225X0025KA1	Capacitor - 2.2 μ F - ± 20% - 25V - Tantalum
HO-C17	CE04W 100MF	Capacitor - 100 μ F - $^{+50}_{-10}$ % - 25V - Electrolytic
HO-C18	196D225X0025KA1	Capacitor - 2.2 μ F - ± 20% - 25V - Tantalum
HO-C19	196D225X0025KA1	Capacitor - 2.2 μ F - ± 20% - 25V - Tantalum
HO-C20	196D225X0025KA1	Capacitor - 2.2 μ F - ± 20% - 25V - Tantalum
HO-C21	196D225X0025KA1	Capacitor - 2.2 μ F - ± 20% - 25V - Tantalum
HO-C22	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C23	ECS-Z16HS1 (NL)	Capacitor - 1 μ F ± 20% - 16V - Tantalum
HO-C24	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C25	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C26	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C27	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C28	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C29	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C30	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-C31	ECS-Z16HS1 (NL)	Capacitor - 1 μ F - ± 20% - 16V - Tantalum
HO-S1	LM308H	Integrated Circuit
HO-S2	LM308H	Integrated Circuit
HO-S3	AD574JD	Integrated Circuit
HO-S4	TLP508	Opto Coupled Isolator
HO-S5	SN74LS132N	Integrated Circuit
HO-S6	SN74LS221N	Integrated Circuit
HO-S7	LM308H	Integrated Circuit
HO-S13	MC14517BCP	Integrated Circuit
HO-S14	MC14517BCP	Integrated Circuit
HO-S15	MC14517BCP	Integrated Circuit
HO-S16	MC14517BCP	Integrated Circuit
HO-S17	MC14517BCP	Integrated Circuit
HO-S18	MC14517BCP	Integrated Circuit
HO-S19	MC14517BCP	Integrated Circuit
HO-S20	MC14517BCP	Integrated Circuit
HO-S21	MC14517BCP	Integrated Circuit
HO-S22	MC14517BCP	Integrated Circuit
HO-S23	AD7533LN	Integrated Circuit
HO-S24	SD-101	Diode
HO-S25	1S1588	Diode
HO-S26	1S2187	Zener Diode
HO-S27	LM308H	Integrated Circuit
HO-S28	LM308H	Integrated Circuit
HO-S29	1S1588	Diode
HO-S30	1S1588	Diode
HO-S31	1S1588	Diode
HO-S32	LM340T15	Integrated Circuit

Ref. No.	Part No.	Description
HO-S33	LM340T05	Integrated Circuit
HO-S34	MC7915CT	Integrated Circuit
HO-S35	1S1588	Diode
HO-PB1	SY-273	Synchronizer Board Assembly
HO-SW1	RSA-700A	Rotary Switch
HO-SW2	M-2012	Toggle Switch
HO-R36	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film (Corresponds to CR-R39)
HO-S37	2SC1815Y	Transistor (Corresponds to CR-S37)
HO-J203	3250-018-098	Connector-Receptacle - 18 Pin
(Note)		
HO-J202	3250-018-098	AR-J202 connector for Channel 2 Input Module mounted on the Assembly No. MB-278 Motherboard.

Table 9.31 IO OPTION 11 Synchronizer Parts List

Ref. No.	Part No.	Description
IO-R1	λ-13S 2K	Resistor-Variable - 2K
IO-R2	λ-13S 2K	Resistor-Variable - 2K
IO-R3	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
IO-R4	NAS 1/4J 5K	Resistor - 5K - ± 5% - 1/4W - Carbon Film
IO-R5	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R6	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
IO-R7	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R8	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R9	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R10	NAS 1/4J 330	Resistor - 330 - ± 5% - 1/4W - Carbon Film
IO-R11	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R12	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R13	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R14	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R15	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R16	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R17	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R18	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R19	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R20	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R21	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R22	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R23	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R24	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R25	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R26	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R27	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R28	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R29	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
IO-R30	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
IO-R31	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R32	NAS 1/4J 8.2K	Resistor - 8.2K - ± 5% - 1/4W - Carbon Film
IO-R33	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
IO-R34	λ-13S 2K	Resistor-Variable - 2K
IO-R35	λ-13S 2K	Resistor-Variable - 2K
IO-R36	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
IO-R37	NAS 1/4J 8.2K	Resistor - 8.2K - ± 5% - 1/4W - Carbon Film
IO-R38	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R39	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
IO-R40	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R41	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R42	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R43	NAS 1/4J 680	Resistor - 680 - ± 5% - 1/4W - Carbon Film

Ref. No.	Part No.	Description
IO-R44	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R45	NAS 1/4J 4.7K	Resistor - 4.7K - ± 5% - 1/4W - Carbon Film
IO-R46	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R47	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R48	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R49	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R50	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R51	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R52	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R53	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R54	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R55	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R56	NAS 1/4J 10K	Resistor - 10K - ± 5% - 1/4W - Carbon Film
IO-R57	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R58	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R59	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R60	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R61	NAS 1/4J 39K	Resistor - 39K - ± 5% - 1/4W - Carbon Film
IO-R62	RN92E-2B-473G	Resistor - 47K - ± 2% - 1/8W - Metal Film
IO-R63	RN92E-2B-912G	Resistor - 9.1K - ± 2% - 1/8W - Metal Film
IO-R64	RN92E-2B-103G	Resistor - 10K - ± 2% - 1/8W - Metal Film
IO-R65	NAS 1/4J 8.2K	Resistor - 8.2K - ± 5% - 1/4W - Carbon Film
IO-R66	NAS 1/4J 1K	Resistor - 1K - ± 5% - 1/4W - Carbon Film
IO-C1	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C2	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C3	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IO-C4	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
IO-C5	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IO-C6	DEP (M) 0.2MF	Capacitor - 0.2 μF - ± 20% - 50V - Polyester
IO-C7	DD104B101K	Capacitor - 1000 pF - ± 10% - 50V - Ceramic
IO-C8	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 50V - Tantalum
IO-C9	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 50V - Tantalum
IO-C10	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 50V - Tantalum
IO-C11	DD104B101K	Capacitor - 1000 pF - ± 10% - 50V - Ceramic
IO-C12	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IO-C13	DD105CH101J	Capacitor - 100 pF - ± 5% - 50V - Ceramic
IO-C14	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IO-C15	DD105CH330J	Capacitor - 33 pF - ± 5% - 50V - Ceramic
IO-C16	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C17	CE04W 100MF	Capacitor - 100 μF - $^{+50}_{-10}$% - 25V - Electrolytic
IO-C18	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C19	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C20	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C21	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C22	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum

Ref. No.	Part No.	Description
IO-C23	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C24	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C25	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C26	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C27	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C28	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C29	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C30	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C31	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C32	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C33	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C34	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C35	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C36	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C37	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C38	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C39	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C40	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
IO-C41	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
IO-C42	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
IO-C43	DEP (M) 0.022MF	Capacitor - 0.022 μF - ± 20% - 50V - Polyester
IO-C44	DD104B101K	Capacitor - 1000 p F - ± 10% - 50V - Ceramic
IO-C45	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C46	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C47	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C48	DD104B101K	Capacitor - 1000 p F - ± 10% - 50V - Ceramic
IO-C49	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
IO-C50	DD105CH101J	Capacitor - 100 p F - ± 5% - 50V - Ceramic
IO-C51	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
IO-C52	DD105CH330J	Capacitor - 33 p F - ± 5% - 50V - Ceramic
IO-C53	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C54	CE04W 100MF	Capacitor - 100 μF - $^{+\ 50}_{-\ 10}$% - 25V - Electrolytic
IO-C55	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C56	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C57	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C58	196D225X0025KA1	Capacitor - 2.2 μF - ± 20% - 25V - Tantalum
IO-C59	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IC-C60	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C61	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C62	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C63	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C64	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C65	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C66	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C67	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum

Ref. No.	Part No.	Description
IO-C68	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C69	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C70	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C71	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C72	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C73	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C74	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C75	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C76	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C77	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-C78	196D105X0035KA1	Capacitor - 1 μF - ± 20% - 35V - Tantalum
IO-J1	IL-10P-S3EN2	Connector-Receptacle - 10 Pin
IO-J2	IL-6P-S3EN2	Connector-Receptacle - 6 Pin
IO-J3	IL-10P-S3EN2	Connector-Receptacle - 10 Pin
IO-S1	LM308H	Integrated Circuit
IO-S2	LM308H	Integrated Circuit
IO-S3	AD574JD	Analog to Digital Converter Integrated Circuit
IO-S4	TLP508	Opto Coupled Isolator
IO-S5	74LS132N	Integrated Circuit
IO-S6	MC14520BCP	Integrated Circuit
IO-S7	74LS221	Integrated Circuit
IO-S8	LM308H	Integrated Circuit
IO-S9	MC14006BCP	Integrated Circuit
IO-S10	MC14006BCP	Integrated Circuit
IO-S11	MC14006BCP	Integrated Circuit
IO-S12	MC14006BCP	Integrated Circuit
IO-S13	MC14006BCP	Integrated Circuit
IO-S14	MC14557BCP	Integrated Circuit
IO-S15	MC14557BCP	Integrated Circuit
IO-S16	MC14557BCP	Integrated Circuit
IO-S17	MC14557BCP	Integrated Circuit
IO-S18	MC14557BCP	Integrated Circuit
IO-S19	MC14557BCP	Integrated Circuit
IO-S20	MC14557BCP	Integrated Circuit
IO-S21	MC14557BCP	Integrated Circuit
IO-S22	MC14557BCP	Integrated Circuit
IO-S23	MC14557BCP	Integrated Circuit
IO-S24	AD7533LN	Digital to Analog Converter Integrated Circuit
IO-S25	SD101	Diode
IO-S26	1S1588	Diode
IO-S27	SD101	Diode
IO-S28	LM308H	Integrated Circuit
IO-S29	LM308H	Integrated Circuit
IO-S30	10D2	Diode
IO-S31	10D2	Diode

Ref. No.	Part No.	Description
IO-S32	10D2	Diode
IO-S33	LM340T15	Integrated Circuit
IO-S34	LM340T05	Integrated Circuit
IO-S35	MC7915CT	Integrated Circuit
IO-S37	LM308H	Integrated Circuit
IO-S38	LM308H	Integrated Circuit
IO-S39	AD574JD	Analog to Digital Converter Integrated Circuit
IO-S40	TLP508	Opto Coupled Isolator
IO-S41	74LS132N	Integrated Circuit
IO-S42	14520BCP	Integrated Circuit
IO-S43	74LS221	Integrated Circuit
IO-S44	LM308H	Integrated Circuit
IO-S45	MC14006BCP	Integrated Circuit
IO-S46	MC14006BCP	Integrated Circuit
IO-S47	MC14006BCP	Integrated Circuit
IO-S48	MC14006BCP	Integrated Circuit
IO-S49	MC14006BCP	Integrated Circuit
IO-S50	MC14557BCP	Integrated Circuit
IO-S51	MC14557BCP	Integrated Circuit
IO-S52	MC14557BCP	Integrated Circuit
IO-S53	MC14557BCP	Integrated Circuit
IO-S54	MC14557BCP	Integrated Circuit
IO-S55	MC14557BCP	Integrated Circuit
IO-S56	MC14557BCP	Integrated Circuit
IO-S57	MC14557BCP	Integrated Circuit
IO-S58	MC14557BCP	Integrated Circuit
IO-S59	MC14557BCP	Integrated Circuit
IO-S60	MC14517BCP	Integrated Circuit
IO-S61	MC14517BCP	Integrated Circuit
IO-S62	MC14517BCP	Integrated Circuit
IO-S63	MC14517BCP	Integrated Circuit
IO-S64	MC14517BCP	Integrated Circuit
IO-S65	AD7533LN	Digital to Analog Converter Integrated Circuit
IO-S66	SD101	Diode
IO-S67	1S1588	Diode
IO-S68	SD101	Diode
IO-S69	LM308H	Integrated Circuit
IO-S70	LM308H	Integrated Circuit
IO-S71	10D2	Diode
IO-S72	10D2	Diode
IO-S73	10D2	Diode
IO-S74	LM340T15	Integrated Circuit
IO-S75	LM340T05	Integrated Circuit
IO-S76	MC7915CT	Integrated Circuit
IO-S77	1S1588	Diode

Ref. No.	Part No.	Description
IO-PB1	SY-360	Synchronizer Board Assembly
IO-PB2	SW-361	Synchronizer Controls Board Assembly
IO-SW1	M-2022	Toggle Switch
IO-SW2	M-2042	Toggle Switch
IO-SW3	S-1010	Thumb-Wheel Switch
IO-SW4	S-1010	Thumb-Wheel Switch
IO-R70	NAS 1/4J 10K	Resistor - 10K - ±5% - 1/4W - Carbon Film (Corresponds to DR-R39)
IO-S80	2SC1815Y	Transistor (Corresponds to DR-S40)
IO-J1	IL-10P-S3EN2	Connector-Receptacle - 10 Pin
	IL-10S-S3L	Connector-Plug - 10 Pin
IO-J2	IL-6P-S3EN2	Connector-Receptacle - 6 Pin
	IL-6S-S3L	Connector-Plug - 6 Pin
IO-J3	IL-10P-S3EN2	Connector-Receptacle - 10 Pin
	IL-10S-S3L	Connector-Plug - 10 Pin
IO-J4	1168-036-009	Connector-Plug - 36 Pin

Table 9.32 JO OPTION 12 Retransmitting Potentiometer Output Parts List

Ref. No.	Part No.	Description
JO-J1	1625-3R	Connector-Receptacle - 3 Pin
	1625-3P-1	Connector-Plug - 3 Pin
JO-J2	1625-3R	Connector-Receptacle - 3 Pin
	1625-3P-1	Connector-Plug - 3 Pin
JO-J3	1625-3R	Connector-Receptacle - 3 Pin
	1625-3P-1	Connector-Plug - 3 Pin
JO-J101	57-40240	Connector-Receptacle - 24 Pin
JO-R1	P-136-2G-04	Dual Potentiometer - 5K + 5K
JO-R2	P-136-2G-04	Dual Potentiometer - 5K + 5K
JO-R3	P-136-2G-04	Dual Potentiometer - 5K + 5K

4. OPERATION PROCEDURE

4-1 Descriptions and Functions of Parts

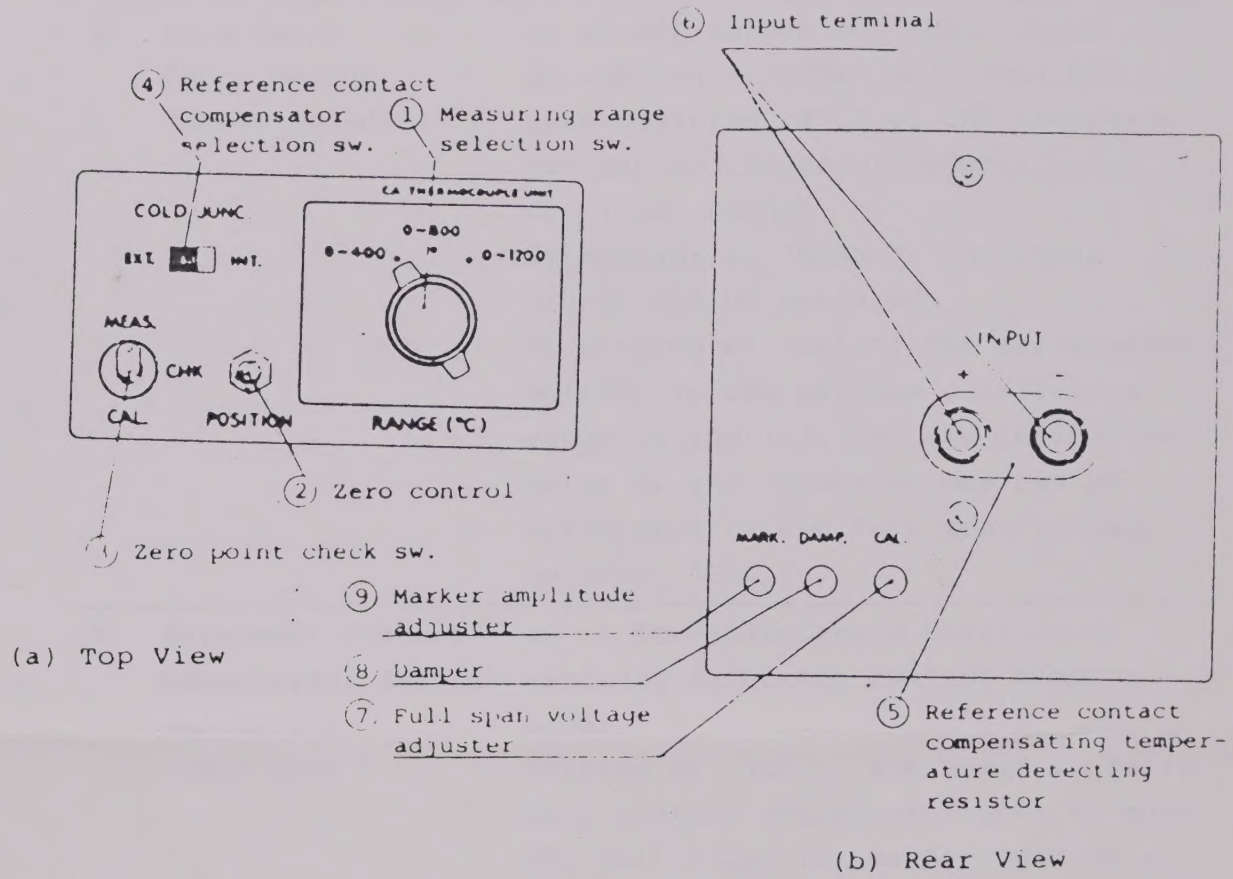


Fig. 4-1 Amplifier Unit Panel

The panel of Model 1240-TM-42L is illustrated.

The panel indication slightly differs according to each specification.